



## I. INTRODUCTION

The Badlands National Park Fire Management Plan (FMP) is a part of the park Resource Management Plan. An environmental assessment (EA) was prepared and made available for public review as part of this plan (see *Appendix D*). This FMP and the accompanying EA meet requirements of the National Environmental Policy Act (NEPA, 42 U.S.C. §4321 *et seq.*) and the National Historic Preservation Act (NHPA, 16 U.S.C. §470 *et seq.*). It will serve as a detailed program of action, providing specific guidance and procedures for accomplishing wildland fire management objectives.

This document is mandated by and complies with National Park Service (NPS) *Director's Order #18: Wildland Fire Management* (DO-18, USDI 2002), which outlines NPS fire management policy and requires that "every park area with burnable vegetation must have a fire management plan approved by the Superintendent". More specific guidance is found in *Reference Manual 18* (RM-18, USDI 1999). This plan also complies with the Service's policy guidance, the *Management Policies* (USDI 2001). The Organic Act of the National Park Service (16 U.S.C §1 *et seq.*) provides the primary authority for implementation of this plan.

This plan will implement fire management policies and help achieve resource management and fire management goals as defined in: (1) the *2001 Federal Wildland Fire Management Policy & Program Review* (USDA/USDI 2001); (2) *Managing Impacts of Wildfires on Communities and the Environment*, and *Protecting People and Sustaining Resources in Fire Adapted Ecosystems-A Cohesive Strategy* (USDI/USDA); and (3) *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan*.

As NPS management planning becomes more science-based and proactive, fire management assumes a role of greater importance. This Fire Management Plan has been prepared to serve as a detailed program of action, which provides specific guidance and procedures for accomplishing park fire management objectives. The implementation of this plan will define levels of protection necessary to ensure safety, protection of facilities and resources; will minimize undesirable environmental impacts of fire management, and will define levels of fire use to restore and perpetuate natural processes given current understanding of the complex relationships in natural ecosystems.

Cooperation and collaboration are important in land management, and particularly in fire management. This plan tiers off the park General Management Plan (in draft) planning process, which involves input from a wide variety of park neighbors, other agencies and Native American tribes. Development of this plan has involved the collaborative efforts of the NPS Northern Great Plains Fire Management Office, the Midwest Region Fire Management Office, fire ecologists from other parks and agencies, and park staff. Implementation of the plan will be dependent upon collaboration with the Northern Great Plains Fire Management Office, the US Forest Service, the Northern Plains Interagency Dispatch Center, local area volunteer fire departments, the Bureau of Indian Affairs, the South Dakota State Fire Management Coordinator, other area national park units, and all park divisions. Native American tribes will be consulted prior to approval of the plan.



## ENABLING LEGISLATION

Authority for establishment and management of Badlands National Park is found in the following acts:

1. An act to establish the Badlands National Monument, March 4, 1929 (45 Stat. 1553);
2. An act to extend the boundaries of Badlands National Monument, June 26, 1936 (49 Stat. 1979);
3. A Presidential Proclamation (#2320) extending the boundaries of Badlands National Monument, January 26, 1939 (53 Stat. 2521);
4. An act to adjust the boundary of Badlands National Monument, May 7, 1952 (66 Stat. 65);
5. An act to revise the boundaries of Badlands National Monument and to authorize the exchange of land with the Oglala Sioux Tribe, Aug. 8, 1968 (82 Stat. 663);
6. An act to designate lands within the National Park System as wilderness and to revise the boundaries of certain of those units, Oct. 20, 1976 (90 Stat. 2693);
7. An act to change the name of Badlands National Monument to Badlands National Park, Nov. 10, 1978 (92 Stat. 3467).

## OTHER AUTHORITIES

The authority for NPS Fire Program (FIREPRO) funding (Normal Fire Year Programming) and all emergency fire accounts is found in the following authorities:

- Section 102 of the General Provisions of the Department of Interior's (DOI) annual Appropriations Bill - provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.
- Public Law 101-121, DOI and Related Agencies Appropriation Act of 1990 - established the funding mechanism for normal year expenditures of funds for fire management purposes.
- 31 U.S.C. §665 (E) (1) (B) - provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Incident Management Handbook. Authorities to enter into agreements with other Federal bureaus and agencies; with state, county, and municipal governments; and with private companies, groups, corporations, and individuals are cited in *Director's Order #20: Agreements (DO-20, USDI 1999)*.

Authority for interagency agreements is found in "Interagency Agreement between the Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), National Park Service (NPS), U.S. Fish and Wildlife Service (USFWS) of the United States Department of the Interior (USDI) and the Forest Service (USFS) of the United States Department of Agriculture (USDA)" (1982). Authority for rendering emergency fire or rescue assistance outside the National Park System is the Act of August 8, 1953 (16 U.S.C. §1b(1)) and Department of the Interior Manual (910 DM).



Existing agreements pertaining to implementation of the fire management program are cited or included in *Appendix E(3)*. As a general rule, these agreements give guidance on mutual aid zones for wildland fire suppression activities and specify procedures for billing and payment between agencies for wildland fire management activities.

## INTERAGENCY FIRE POLICY

Federal wildland fire policy is established in the *Federal Wildland Fire Management Policy & Program Review of 1995* (USDA/USDI 1995). This policy was reviewed following 2000 fire season (USDA/USDI 2001). The 2001 Working Group found that the policy is generally sound, but recommended changes:

In summary, the Working Group finds and recommends that federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability.

Recognizing the ecological role of fire and the goal of ecosystem sustainability in federal policy reflects a fundamental change in our society's perception of fire and its role in land management. Principal conclusions of the Working Group included:

- As a result of fire exclusion, the condition of fire-adapted ecosystems continues to deteriorate; the fire hazard situation in these areas is worse than previously understood.
- Changes and additions to the 1995 Federal Fire Policy are needed to address important issues of ecosystem sustainability, science, education, communication, and to provide for adequate program evaluation.

In addition, the review stated, "The 2001 Federal Fire Policy and its implementation are founded on the following guiding principles:"

1. Firefighter and public safety is the first priority in every fire management activity.
2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.
3. Fire management plans, programs, and activities support land and resource management plans and their implementation.
4. Sound risk management is a foundation for all fire management activities.
5. Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives.
6. Fire management plans and activities are based upon the best available science.
7. Fire management plans and activities incorporate public health and environmental quality considerations.
8. Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.
9. Standardization of policies and procedures among federal agencies is an ongoing objective.

This plan is intended to follow these principles and incorporate them into all aspects of the Badlands National Park Fire Management Program.

Department of the Interior policy, as specified in *Wildland and Prescribed Fire Management Policy: Implementation Procedures Reference Guide* (1998), states that all fires in wildland fuels will be classified as either "wildland fire" or "prescribed fire".

**Wildland fire** is defined as any non-structure fire, other than prescribed fire, that occurs in the wildland. These fires can, but do not always, achieve burning intensities capable of causing



loss of life, detrimental impacts upon natural resources, and damage to, or destruction of, man-made developments. With the implementation of this plan, managers will have a wide range of appropriate management responses to naturally ignited wildland fires, while all human-caused fires will be suppressed. The management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined herein is defined as wildland fire use.

**Prescribed fire** is defined as any fire ignited by management actions to meet specific objectives. These fires are conducted under prescription, and on a predetermined area that will produce the intensity of heat and rate of spread required to accomplish specific management objectives. Overall, fire use (the combination of wildland fire use and prescribed fire application) objectives are to employ fire scientifically to realize maximum net benefits at minimum impact and acceptable cost.

Within the framework of management objectives and plans, overall negative wildland fire impacts will be held to the minimum possible giving full consideration to:

1. firefighter and public safety,
2. an aggressive fire prevention program,
3. the least expenditure of public funds for effective suppression,
4. the methods of suppression least damaging to resources and the environment, and
5. integration of cooperative suppression actions by agencies of the DOI among themselves or with other qualified suppression organizations.

## NATIONAL PARK SERVICE FIRE POLICY

National Park Service management policy directs each park to prepare a wildland fire management plan appropriate for that park's purpose and resources. As stated previously, fire management at Badlands National Park is based upon this policy and the guidance found in *Director's Order #18* and the supporting *Reference Manual 18*. These guidelines identify fire as the most aggressive natural resources management tool employed by the National Park Service.

*DO-18* identifies the goals of the NPS wildland fire management program. These goals are:

1. Conduct a vigorous and safe wildland fire management program with the highest professional and technological standards.
2. Identify the type of wildland fire that is most appropriate to specific situations and areas.
3. Efficiently accomplish resource management objectives through the application and management of prescribed and wildland fires.
4. Continually evaluate the wildland fire program operations and accomplishments to better meet program goals by refining treatment and monitoring methods, and by integrating applicable technical and scientific advancements.



## II. RELATIONSHIP TO LAND MANAGEMENT PLANNING AND FIRE POLICY

### NPS MANAGEMENT POLICIES

Badlands National Park was originally established by presidential proclamation as a national monument "to preserve the scenic and scientific values of a portion of the White River Badlands and to make them accessible for public enjoyment and inspiration." In order to preserve these values, an active fire management program is required to maintain the fire-dependent ecosystem. The Fire Management Plan is a working document that details how the park will control and/or use fire to preserve park resources for future generations. The primary values to be protected include scenic values, geologic values of "badlands" formations, scientifically significant fossilized remains of over 250 faunal species, large expanses of remnant native mixed-grass prairie and associated native wildlife species, and the human occupation story for the past 11,000 years.

NPS *Management Policies* (USDI 2001, sec. 4.5) provide the guidance for integration of fire into overall park management and resource management objectives:

Naturally ignited fire is a process that is part of many of the natural systems that are being sustained in parks. Human-ignited fires often cause the unnatural destruction of park natural resources. Wildland fire may contribute to our hinder the achievement of park management objectives. Therefore, park fire management programs will be designed to meet park resource management objectives while ensuring that firefighter and public safety are not compromised.

Each park with vegetation capable of burning will prepare a fire management plan and will address the need for adequate funding and staffing to support its fire management program. The plan will be designed to guide a program that responds to the park's natural and cultural resource objectives; provides for safety considerations for park visitors, employees, neighbors, and developed facilities; and addresses potential impacts to public and private property adjacent to the park. An environmental assessment developed in support of the plan will consider the effects on air quality, water quality, health and safety, and natural and cultural resource management objectives. Preparation of the plan and environmental assessment will include collaboration with adjacent communities, interest groups, state and federal agencies, and tribal governments.

### GENERAL MANAGEMENT OBJECTIVES

The Badlands National Park Master Plan (1982) recognizes fire as "a natural part of the ecosystem." The plan further states that "a fire management plan will establish guidelines for managing natural fires to perpetuate natural ecosystems while recognizing the interest of adjacent landowners." The Statement for Management (1992) also expresses the need for prescribed fire, stating that the park should "recognize fire as a natural factor in park ecosystems, control natural fire as necessary, and use prescribed burns when needed." Revision of the park's General Management plan began in the year 2000, and as of the writing of this plan, is in draft and has not yet been approved for public review and comment. Through the GMP planning process, fire management objectives may be further refined. However, the approved GMP will certainly recognize the importance of fire as a primary factor in maintaining and restoring the native prairie the park is mandated to preserve. The desired future conditions



identified in the GMP will include a native prairie in which fire, as a natural process and a management tool, acts to maintain native plant communities and native animal populations, prevent and/or reduce invasive non-native plant species, and enhance biodiversity.

## **RESOURCE MANAGEMENT OBJECTIVES**

This Fire Management Plan prescribes actions necessary to implement servicewide fire management policies (*DO-18*, 2002) and to achieve park resource management objectives. The current park Resource Management Plan (1999) states "without the occurrence of fire, the vegetation of the park has been allowed to progress to an unknown condition in relation to a fire-influenced regime." This plan further states that the park Fire Management Program should restore fire as "one of the vital and dynamic processes in the Badlands environment to reduce risk to adjacent lands, while at the same time reintroducing fire into areas that normally could not burn due to concern for public safety and public and private property values."

More specifically, the Badlands National Park resource management objectives related to the Fire Management Program are:

- 1) Alter vegetation composition in natural areas, from exotic plant species (Japanese brome, smooth brome, Kentucky bluegrass, crested wheatgrass, and Canada thistle) to native plant species.
- 2) Promote hardwood regeneration in woody draw areas of the park. Most, if not all, of these areas are decadent or remain dormant. As a result, nutritional quality and productivity have declined. Without the rejuvenating effects of fire, these communities may continue to deteriorate and the value to native wildlife may also decline.
- 3) Restore or gain the mosaic pattern of different plant communities associated with post-fire stages.
- 4) Rehabilitate areas that have been planted or established with non-native grasses (roadsides, pullouts, and other disturbed sites).
- 5) Manage grasslands to increase suitable habitat for butterfly species listed on the SD Natural Heritage List (Regal Fritillary and Tawny Crescent).
- 6) Improve the nutritional quality and palatability of native grasses, shrubs, and trees for use by ungulate species in the park.
- 7) Maintain distribution of wildlife/range use throughout the park by burning large enough areas so that bison, sheep, and deer do not concentrate in one small area of the park.
- 8) Restore fire as a critical component of the ecosystem.
- 9) To the extent practical, use fire as a tool to restore the ecosystem to the condition existing prior to settlement by Europeans. The primary factors here are: (1) fire suppression, which began in the late 1800's; and (2) agriculture, which not only directly replaced native vegetation, but also served as fire breaks, inhibiting the natural spread of fire across landscapes.

## **WILDERNESS POLICIES**

Badlands National Park includes 64,000 acres of legally designated wilderness (PL 94-567, 1976), known as the Badlands Wilderness Area (BWA). Fire management activities within the



BWA must conform to policy guidance under the 1964 Wilderness Act (16 U.S.C. §1131).

National Park Service *Management Policies* (2001) provides overall guidance for fire management within wilderness:

Fire management activities conducted in wilderness areas will conform to the basic purposes of wilderness. The park's fire management and wilderness management plans must identify and reconcile the natural and historic roles of fire in the wilderness, and will provide a prescription for response, if any, to natural and human-caused wildfires. If a prescribed fire program is implemented, these plans will also include the prescriptions and procedures under which the program will be conducted within wilderness.

Action taken to suppress wildfires will use the minimum requirement concept, and will be conducted in such a way as to protect natural and cultural resources and to minimize the lasting impacts of the suppression actions. Information on developing a fire management program in wilderness is contained in Director's Order #18: Wildland Fire Management. (Chapter 6, 6.3.9)

Motorized equipment will not normally be used to suppress fires in the Badlands Wilderness Area. However, due to rapid spread rates and the emergency nature of fires near the boundary, light motorized equipment, such as all-terrain vehicles, may be authorized by the Superintendent to control fires on an emergency basis.

Additional constraints applicable to Wilderness Areas include:

- Use of helicopters for aerial ignition, water drops, and transport of personnel, supplies or equipment will be evaluated for each fire situation. Improvement of landing sites shall be kept to a minimum and requires approval of the Superintendent. Helibases will be located outside the Wilderness boundaries. Landing sites within Wilderness will be rehabilitated to pre-fire conditions, to the extent reasonably possible.
- When handline construction is required, construction standards will be issued requiring the handline to be built with minimum impact to wilderness characteristics. The Superintendent may authorize use of power chain saws, although such use should be kept to a minimum. Handlines constructed by exposing mineral soil will be rehabilitated and erosion control methods used on slopes exceeding 10%.
- Incident Command Posts and camps will be located outside designated Wilderness, unless there is a compelling reason for a low-impact spike camp to support wildland fire use operations within the Natural FMU.

Minimum impact suppression is defined as the aggressive application of those strategies and tactics that effectively meet suppression and rehabilitation objectives with the least cultural and environmental impact. All fire management activities in the Badlands Wilderness Area will comply with *Director's Order #41: Wilderness Preservation Management* and *RM-41*, and will use "Minimum Requirement Analysis" process as specified for the park. The following constraints applicable to all suppression actions include:

- Whenever consistent with safe, effective suppression techniques, the use of natural barriers, such as unvegetated badlands, should be used as extensively as possible. The use of backfire techniques, burnout lines improvement, and wetting agents (ground and airborne) is authorized. Fire retardant agent used must be on the approved list of retardant for utilization by the Forest Service and Bureau of Land Management.
- All extended attack and project fire operations should have a park employee designated and available to assist suppression forces in the capacity of Resource Advisor.
- Stream crossings should be limited to established locations.



- Except for spot maintenance to remove obstructions, no improvements should be made to roadways, trails, water sources, or clearings. All sites where improvements are made or obstructions removed should be rehabilitated to pre-fire conditions, to the extent reasonably possible.
- Earth moving equipment such as tractors, graders, bulldozers or other tracked vehicles should not be used for fire suppression. If special circumstances warrant extreme measures to ensure protection, the Superintendent can authorize the use of heavy equipment.
- Fireline construction, which is generally avoided in Badlands fire activities, shall be outside of highly erosive areas, steep slopes, and other sensitive areas. Following fire suppression activities, any firelines should be recontoured and have water-bars installed.

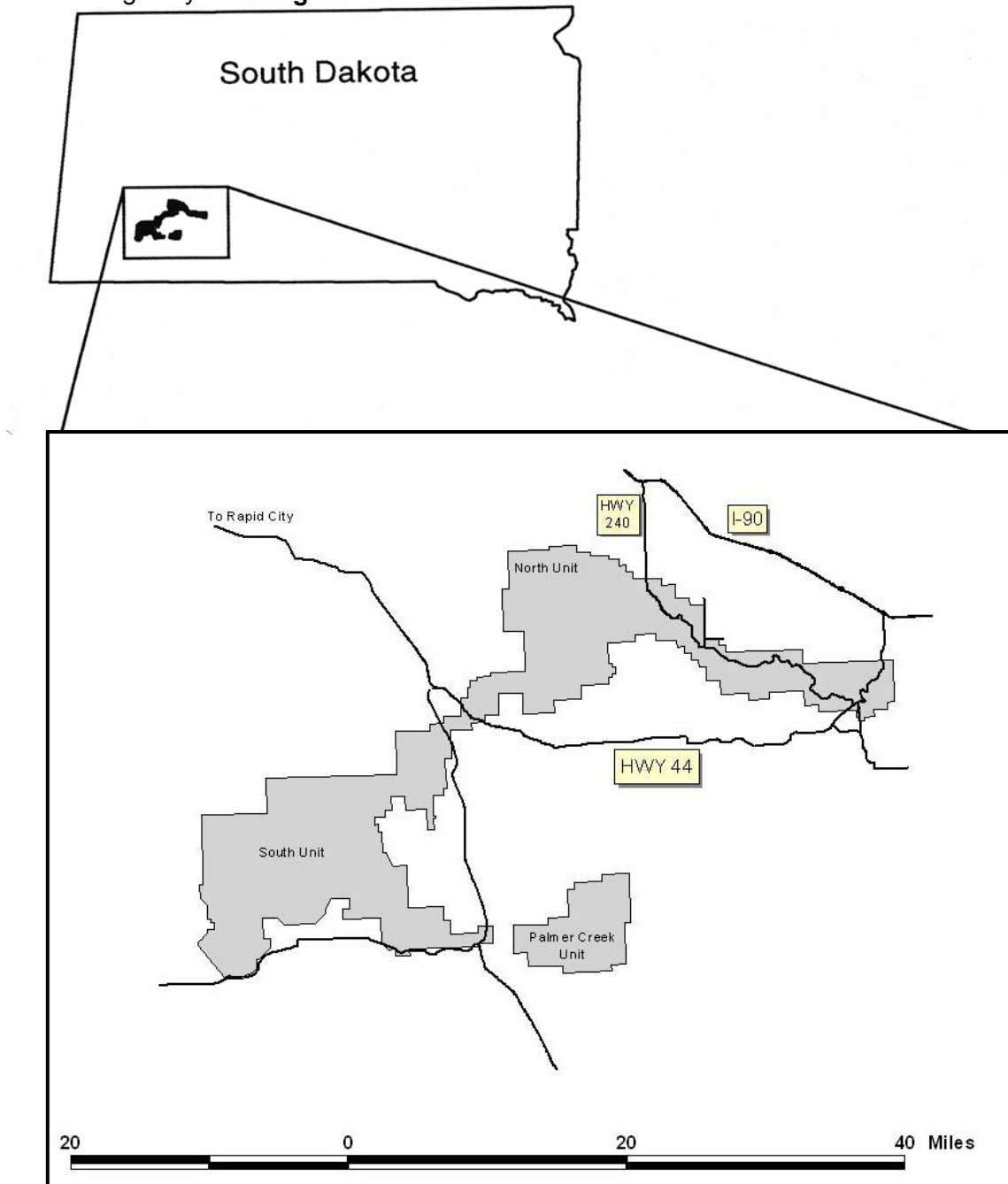




### III. THE PARK SETTING AND RESOURCES

#### LOCATION

Badlands National Park is located in southwestern South Dakota, in Jackson, Pennington, and Shannon Counties. Access can be obtained from Interstate 90, South Dakota Highway 44, and South Dakota Highway 240. **Fig. 1:**

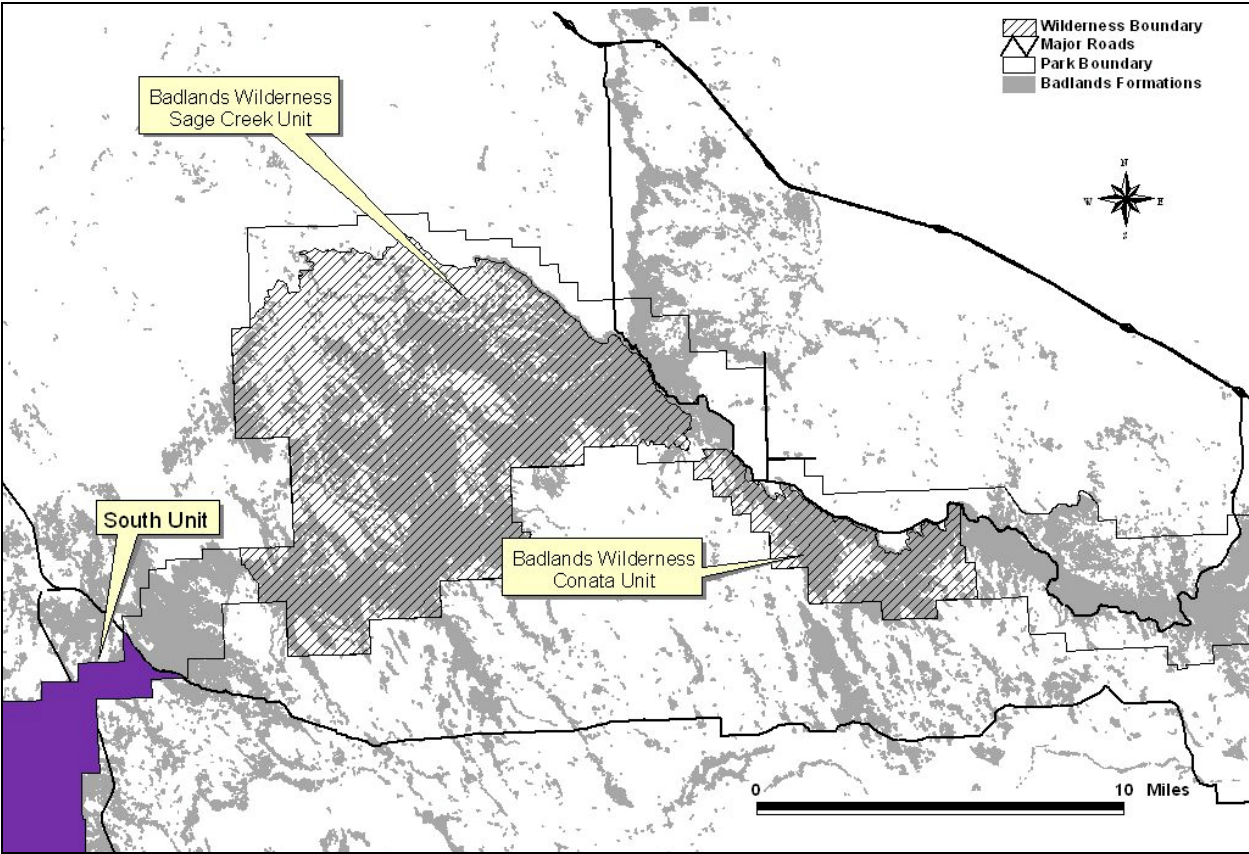




The park is administratively divided into two units (see **Fig. 1** above). The North Unit is owned by the federal government in fee simple and, like most of the early “traditional” parks, the National Park Service has sole management authority. The South Unit is located on the Pine Ridge Indian Reservation and is “trust” land, intended to be managed cooperatively by the National Park Service and Oglala Sioux Tribe. The park is further segmented administratively. The North Unit is split into the Cedar Pass District on the east side, and the Pinnacles District on the west. The South Unit is split into the Stronghold District and the Palmer Creek District, which is not coterminous to the rest of the park.

Badlands National Park has 64,144 acres of designated wilderness, in two separate units, The Sage Creek Unit and the Conata Unit:

**Fig. 2: Badlands Wilderness Area**





The park is characterized by barren canyons, peaks, and ridges intermixed with large areas of mixed-grass prairie providing habitat for large numbers of wildlife and plant species.

The park boundary was established along jurisdictional lines rather than geographic features. In certain areas (primarily the Cedar Pass District), the park is extremely narrow (less than 2 miles) causing concern for the spread of fire to adjacent lands.

Approximately 730 acres of visitor services, residential, and administrative facilities exist at Cedar Pass, Stronghold, Pinnacles, and the bison corrals. The park has 10 permanent resident employees and their families, 29 seasonal employees, and an annual total visitation of about 1.1 million.

The Stronghold District is located entirely on the Pine Ridge Indian Reservation. It is open to grazing in accordance with Tribal/Bureau of Indian Affairs regulations. Land ownership adjacent to the Stronghold District is a combination of tribally owned lands and lands held by individual Indians and non-Indians.

The Palmer Creek District is also located entirely on the Pine Ridge Indian Reservation. It is a separate unit located east of the Stronghold District. Currently the NPS has no right of access to this area. It is surrounded by tribally-owned lands and lands held by individual Indians and non-Indians.

The Pinnacles and Cedar Pass Districts of the park are bordered primarily by the Buffalo Gap National Grasslands under the administration of the United States Forest Service (USFS). Privately owned lands are intermixed with federal lands along the park boundary.

## CLIMATE

Badlands National Park has a continental climate characterized by cold winters and hot summers with high variations from day to day. Frequent, brief, and intense electrical storms occur during the summer months. Thunderstorm activity continues into September, with generally less precipitation and more dry lightning. The annual precipitation for the 30-year period between 1961 and 1990 averaged 16 inches per year, with 70% falling between May and June. Between 1991 and 2000, a period of above average precipitation, the average annual precipitation was over 22 inches. This increased the annual average to approximately 17.5 inches per year over the full 40-year period. A comparison of 2001 and 2002 totals provides an indication of annual variance: 19 and 12 inches respectively. Winter precipitation is mostly snow, but because of gusty winds, large areas are blown free of snow and sizable drifts may accumulate in road cuts and protected gullies. Average maximum daytime temperatures reach their highest level during July-August and range from 34° to 91° F throughout the year (see **Table 1 below**). Average minimum temperatures range from 11° to 62° F. Extremes of over 100° can occur during the summer months while sub-zero temperatures can occur during the winter months. Normal average wind speeds range from 8 to 12 mph, with slightly higher averages March through May. However, during thunderstorms or winter storms, locally strong wind events are common.

**Table 1: AVERAGE TEMPERATURE, PRECIPITATION, AND VEGETATION STAGE**

Month	Average High (*F)	Average Low (*F)	Ave. Precipitation (inches)	Vegetation Stage
January	34	11	0.36	C
February	40	16	0.47	C
March	48	24	0.93	T
April	62	35	1.76	G
May	73	46	3.08	G
June	83	56	3.11	G



July	91	62	2.16	T
August	91	61	1.66	T
September	80	50	1.22	C
October	67	38	1.23	C
November	49	25	0.45	C
December	38	17	0.33	C

**Annual Average Precipitation**

**16.76**

Vegetation Stages: C= Cured T= Transition G= Green-up

Weather information from National Weather Service Data 1949-1998

## TOPOGRAPHY, GEOLOGY, AND SOILS

The entire park lies within the unglaciated Missouri Plateau section of the Great Plains physiographic province. It is an area characterized by flat to gently sloping grasslands cut by wide, shallow, terraced valleys of the White, Cheyenne, and Bad Rivers and their principal tributaries. Over time, the retreat of the White River banks has resulted in a unique landscape characterized by barren badlands, including an erosional structure called a "wall." This geologic feature is a distinctive break between the upper and lower grasslands, with an average elevation difference of 200 feet. Elevations within the park range from approximately 2400 feet to 3300 feet. Badlands National Park is a part of the White River or Big Badlands of southwestern South Dakota, an area of steep slopes, numerous small valleys, and sparse vegetation. Badlands topography flanks the White River from south of Kadoka westward to the area south of Red Shirt Table, a distance of 70 miles. Local rock formations are largely soft, fine-grained alluvial clay sediments, comprised of deposition from parent Black Hills material and from volcanic eruptions, which are easily eroded. The rugged topography and variegated rocks produce spectacular visual effects. Badlands National Park was established, in part, for its impressive landforms and spectacular vertebrate fossils.

## VEGETATION

There are no Federal threatened and endangered (T&E) species listed plant species known in the park. A more detailed discussion of all species and their habitats found throughout the park may be found in *Appendix E(4)*. The park is considered to represent potential range and habitat for all species indigenous to semiarid mixed prairie grassland ecosystems. With that in mind, park policy is to continue observing for signs of any T&E species and to continue studying methods of managing park lands that will protect and enhance the habitat for all native species.

However it should be noted, there are a number of exotic species in abundance in the park. These include yellow sweetclover (*Melilotus officinalis*), brome grasses (*Bromus* sp.), Canada thistle (*Cirsium arvense*), Kentucky bluegrass (*Poa pratensis*), crested wheatgrass (*Agropyron cristatum*), and knapweeds (*Centaurea* sp.)

Badlands/mixed grass prairie vegetation is characteristically diverse and found throughout the park. The basis for the difference between pre-settlement vegetation composition and current conditions is found in past livestock grazing practices, elimination and reduction of native wildlife and total suppression fire management policies. With the elimination of livestock grazing, managed cultivation, and concentrated resource management efforts, the current vegetation composition is beginning to reflect what is believed to have naturally existed prior to the influx of the European settlers in the park locale.

The following is a discussion of major landscape areas and corresponding cover types.

**Grassland areas:** Upland plateaus with moderate to gentle rolling slopes describe the upland grassland topography. Primary native grasses found in these areas include western



wheatgrass (*Agropyron smithii*); and green needlegrass (*Stipa viridula*) on clayey sites. Needle and thread (*Stipa comata*); blue grama (*Bouteloua gracilis*); sideoats grama (*Bouteloua curtipendula*); sand dropseed (*Sporobolus cryptandrus*); and buffalograss (*Buchloe dactyloides*) are more common on upland sites. Other plant species relatively common on both sites are upland sedges, such as threadleaf sedge (*Carex filifolia*); western snowberry (*Symphoricarpos occidentalis*); fringed sage (*Artemisia frigida*) and prairie rose (*Rosa arkansana*).

**Woody Draws/Riparian areas:** Woody draws are found in the canyons of the badlands wall, especially those located on northwest to northeast facing slopes of 35% to 70%, and along springs and streams. They are typified by green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), Rocky Mountain juniper (*Juniperus scopulorum*), boxelder (*Acer negundo*), chokecherry (*Prunus virginiana*), sagebrush (*Artemisia* sp.), plains cottonwood (*Populus deltoides*), and a variety of shrubs. Woody draws are generally less than 40 acres in size and provide valuable habitat for wildlife. They comprise approximately 7% of the vegetated areas of the park and are declining region-wide. Prolonged protection from wildland fire has been postulated as one reason for the decline of woody stands and may account for the lack of bur oak (*Quercus macrocarpa*) in the park. Site-specific research on Badlands National Park woody draws was initiated in 1989. Three study sites were treated with prescribed burns in the fall of 1990, with post-treatment sampling to take place for three years. The study was conducted by the USFS Rocky Mountain Forest and Range Experiment Station, though no findings have been reported to date. The Park Fire Management Team recognizes the need to prevent unwanted wildland fire from impacting large amounts of woody draw vegetation in one event. Depending on the results of site-specific research, prescribed fires may be used to restore deciduous woody draw vegetation.

**Badlands Sparse Vegetation:** Approximately 109,715 acres of the park are unvegetated or sparsely vegetated. Drought-tolerant shrubs such as silverscale saltbush (*Atriplex argentea*) and broom snakeweed (*Gutierrezia sarothrae*) and annual forbs can be found dispersed throughout variable badland habitats although the steep badlands formations are completely barren of vegetation. Sparse vegetation can also be found within areas of established prairie dog towns, which cover approximately 2% of the park. (Von Loh et al. 1999).

## FAUNA

Wildlife commonly seen in the park include mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), pronghorn (*Antilocapra americana*), bison (*Bison bison*), black-tailed prairie dog (*Cynomys ludovicianus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), least chipmunk (*Eutamias minimus*), and numerous other smaller rodents. More than 200 species of birds have been sighted, and about 25 kinds of reptiles and amphibians are listed on park records. There is currently a reintroduction program in the park for the black-footed ferret (*Mustela nigripes*), which is currently on the list of Federal endangered species. This species is known to have historically inhabited the park, and feeds upon, as its primary prey, the prairie dog. In 2000 the U.S. Fish and Wildlife Service determined that listing of the black tailed prairie dog was warranted, but precluded from listing consideration at this time. A state prairie dog conservation plan is currently under development for South Dakota. Examples of less restrictive prairie dog control measures outside the park include the current ban on hunting and poisoning of prairie dogs on neighboring lands administered by the U.S. Forest Service (Buffalo Gap National Grasslands). A complete listing of Threatened and Endangered terrestrial species known to inhabit the park may be found in *Appendix C*.

Bison were restored to the area in 1963 and now number approximately 500 to 800 head. Bison management requires that a portion of the park be fenced. Limited water resources



require that the herd be limited to around 650 animals. Surplus bison are rounded up and transferred to Tribal governments and other agencies. A band of Rocky Mountain bighorn sheep (*Ovis canadensis*) was introduced in 1964 to fill the ecological niche formerly occupied by the extinct Audubon bighorn. In the late 1980's a family of swift fox (*Vulpes velox*) was reintroduced in the park, but persisted only a few years. Beginning in 2003, the NPS initiated reintroduction of swift fox into the park, with a three-year plan of releasing 30 wild born fox from Colorado per year. This experimental program is intended to re-establish a self-sustaining swift fox population in and around the park.

## CULTURAL RESOURCES

Fire management activities within the park will be implemented in accordance with the regulations and directions governing the protection of historic and cultural resources as outlined in the Department of Interior Manual Part 519 (519DM), Code of Federal Regulations (36 CFR 800), and *DO-28: Cultural Resource Management* (USDI 1998). National Historic Preservation Act of 1966 (16 U.S.C. §470 et seq.) section 106 clearance will be followed for any fire management activity that may affect historic structures or cultural/archeological resources. Other related policies that will be followed as required include the Archeology and Historic Preservation Act of 1974 (16 U.S.C. §469-469c-2) and the Archeological Resources Protection Act of 1979 (16 U.S.C. §470aa-470mm).

**Archeological Resources:** Research has been conducted on the impacts of fire on archaeological resources. In 2002, Brent Buenger, a Phd. Candidate at Colorado State University in the Department of Anthropology, submitted *Fire Effects on Archaeological Resources During Prescribed and Wildlife Fire in a Prairie Ecosystem (Badlands National Park, Wind Cave National Park, Rocky Mountain National Park)* and determined:

Prescribed burning in grassland fuels produced relatively low temperatures and residence times. Surface temperatures recorded during a May, 2001 burn ranged from 418.8C to 61.6C. The maximum subsurface temperature was 34.6C. The investigator's findings indicate that thermal alteration of the artifacts placed within the test plots was not significant. The majority of discoloration was due to residence deposits, the byproduct of organic combustion, present on all of the artifacts. No significant damage in the form of cracking, spalling, or deformation occurred. Even the wooden objects showed only minor effects of the fire. Based on these observations, it is suggested that prescribed burning in mixed grass fuels presents only a minimal risk to surface artifacts and little or no risk to subsurface artifacts.

**Cultural Landscapes:** A Cultural Landscape Report and Environmental Assessment of Cedar Pass Headquarters area was started in 2002. A project entitled Cultural Landscapes Important to the Oglala Lakota was funded in 2002 but deferred to 2004 until issues relating to management of the South Unit are resolved. The park is scheduled for a parkwide Cultural Landscape Inventory in 2004 and 2005, according to the Midwest Region Cultural Landscape Inventory Program.

**Ethnographic Resources:** A draft Ethnographic Overview was received in 2001. The plant species identified as important to the Lakota people, such as sagebrush, sumac, chokecherry, yucca, and cacti have root structures that have adapted to survive prairie fire. The substructures of these plants are not consumed by fire but instead thrive through exposure to fire. Additionally, the native wildlife populations are also positively impacted by fire as it creates opportunities for new plant shoots to appear for grazers and browsers. Fire was historically used as a tool to draw native prairie animals out for hunting purposes. The ethnographic overview states that scholars have long believed that the Great Plains ecosystem was fundamentally maintained by fire. Many scholars believe most fire was of human origin, while others think natural fires were at least as important. The overview lists the following historic and prehistoric uses for fire by the



Plains Indians: to drive game, to improve forage, to concentrate wildlife in unburned areas, and for use as a weapon. Accidental fires likely also occurred. It goes on to state: "More important than the causes of fire is the matter of fire suppression; this practice, beginning with White land management regimes, is what threatens the long-term viability of grassland ecosystems." Consultation with Tribes affiliated with Badlands National Park has been initiated. Ethnographic resources include traditionally associated peoples. Definitions of these classes of resources are:

*Ethnographic resources* = objects and places, including sites, structures, landscapes, and natural resources, with traditional cultural meaning and value to associated peoples. Research and consultation with associated people identifies and explains the places and things they find culturally meaningful. Ethnographic resources eligible for the National Register of Historic Places are called traditional cultural properties (NPS Management Policies, 2001, p. 129).

*Traditionally associated peoples* = may include park neighbors, traditional residents, and former residents who remain attached to a park area despite having relocated. For purposes of these *Management Policies*, social/cultural entities such as tribes, communities, and kinship units are "traditionally associated" with a particular park when (1) the entity regards park resources as essential to its development and continued identity as a culturally distinct people; (2) the association has endured for at least two generations (40 years); and (3) the association began prior to establishment of the park (NPS Management Policies, 2001, p. 130).

**Museum Collections:** Specimens and artifacts in the park museum collections will be not impacted by the fire. These items have been collected for research purposes and provide relationships to the significant history of the science of paleontology, the human history of settlement in the White River Badlands, and document the history of the development of Badlands National Park. These resources will not be impacted and are therefore dismissed as an impact topic.

**Cultural Resource Surveys:** Badlands National Park archeological sites are described and located in the *Cultural Sites Inventory* book maintained in the Chief of Resource Education's office at Cedar Pass. The Inventory and the Cultural Component of the Resource Management Plan should be consulted by the fire management team when planning prescribed burns, preparedness, or suppression activities. The potential for adverse impacts to cultural resources will be evaluated prior to prescribed burning and in the selection of fire suppression strategies during wildland fires. Protective black-line or other mitigation may be used around sensitive sites.

**Cultural Resource Mapping:** To facilitate the decision making process during any proposed or occurring fire event, a detailed set of digital cultural resource maps needs to be developed and incorporated into the park's geographic information system (GIS). The data set should include location, site number, site type, and site evaluation. This information could then be readily available for prescribed fire planning and to incident commanders for wildland fire management. These digital maps should also include information that will identify preferred fire management activities in regard to specific sites and site types. Actions that could be identified include site avoidance (buffer area), use of physical or applied barriers, mechanical reduction of fuel loads, collection of certain artifact classes prior to burn, follow-up survey, and collection post-burn.

## PALEONTOLOGICAL RESOURCES

The spectacular vertebrate fossils preserved within the White River Badlands have been studied extensively since 1846 and can be found in museum collections throughout the world. Small percentages of the Badlands National Park have been surveyed for fossil resources. Most of these areas consist of historic research sites (Clark et al., 1967) and small scale projects





completed by individual contracts and paleontological interns (Terry, 1995; Cicimurri, 1995; Lala 1996; Martin and McConnell, 1997; Martin and DiBenedetto, 1997, 1998). A pre-construction survey was completed along the Badlands Loop Road in 1996, 1997 and 1998 (Benton, et al. 1998). A three-year baseline survey of fossil bone beds in the Scenic Member of the Brule Formation was conducted from 2000 to 2003. A baseline survey of the Poleslide Member began in 2003. Data from these projects are being entered into the park spatial database.

## **AIR QUALITY**

Historically, the Park and surrounding area have enjoyed excellent air quality, with only occasional, short-term air pollution from transient wildland fire smoke and blowing dust. National Park Service fire management activities which result in the discharge of pollutants (smoke, carbon monoxide, particulates, and other pollutants from fires) are subject to and must comply with all applicable federal, state, interstate, and local air pollution control requirements as specified by Section 118 of the Clean Air Act, as amended (42 U.S.C. §7418). The Badlands Wilderness is designated as a Class I area under the Clean Air Act, prohibiting significant deterioration of air quality. The remainder of the Park is managed as a Class II area, allowing some deterioration of air quality.

The State of South Dakota requires that the park inform the State Department of Air Quality prior to performing prescribed burns. Burning permits are not required. The park will also notify local Federal Aviation Association offices so that pilots may be made aware of possible temporary visibility impairments. Smoke drift affecting neighbors and public roads is also a concern. Smoke dispersal will be a consideration in determining whether or not a prescribed burn is within prescription, as described in respective Prescribed Fire Plans. Generally, the fine fuels in the park generate low volumes of smoke for short duration and are not usually a smoke management problem.

It is likely that pre-settlement visibility was lower than current levels due to frequent fires in summer months. A permanently mounted 35mm camera was used between 1985 and 1987 to monitor visibility near the northeast entrance. Transmissometer data from 1988 to the present has also been used to monitor visibility. The park has 5 years of ozone monitoring data and is currently adding to 11.5 years of Interagency Monitoring of Protected Visual Environments (IMPROVE) data (1988-present). During the ozone monitoring period, Badlands had some of the lowest average ozone concentrations in the NPS monitoring network (USDI 1998). The ozone levels measured are well below those found to damage sensitive plants. Similarly, wet deposition data does not indicate significant acidic deposition, at the present. More recent data may indicate an increase in the presence of atmospheric nitrates. Nitrate and sulfate emissions from regional-scale sources such as industrial and electric utility facilities and energy development projects in eastern Wyoming and western South Dakota are of significant concern to the Badlands airshed, and these emissions are on the rise.

## **WATER RESOURCES**

Water quality of streams and the White River are unknown and not currently monitored. All streams within the park are intermittent, and most originate within the park with the exceptions of the White River and tributaries of Sage Creek, Battle Creek, Cottonwood Creek, and Cedar Creek. Water tables are said to be lower than in historic times, and appear to have contributed to reduced spring and stream flows. Development of naturally occurring water sources has been used to mitigate this water loss, and provide water to the wildlife. The park maintains water impoundments in the Badlands Wilderness Area and elsewhere in the park for the bison population, which, due to fencing, is no longer able to travel outside the park to the historic



water sources of the Cheyenne and White Rivers.

Underground water sources are very limited in and near the park. This shortage is severe enough, that future planned developments may be limited. Local communities and park management have recently become part of the West River/Lyman Jones and Mni Wiconi Water Projects, bringing water from the Missouri River to rural areas of western South Dakota. Cedar Pass has received a new water storage reservoir to store water piped into the park from this source. Water quality monitoring is done only on the well for developments at Cedar Pass. Pinnacles and White River are currently served by a rural water line.



## HUMAN USES

Peak visitor season for the park is Memorial Day Weekend through Labor Day Weekend, with the greatest number of visitors staying only a few hours. Most visitors drive through the Park, stopping infrequently for short walks on Park trails and overlooks. Fewer visitors hike longer distances over the maintained trail system. The Pinnacles and Cedar Pass districts are 110,042 acres in size and include the 64,000 acre Badlands Wilderness Area. There are no maintained trails and limited hiking/backpacking use of the Wilderness. Most use in the Wilderness is by horseback, and generally confined to day trips originating from the Sage Creek Campground, located on the northwest edge of the Wilderness. The Stronghold District, on the Pine Ridge Indian Reservation, is open to grazing in accordance with Tribal/Bureau of Indian Affairs regulations. In addition, the Tribe retains mineral rights on tribal lands in the Stronghold District, and the Bureau of Indian Affairs administers livestock stocking levels. Grazing pressure influences fine-fuel loadings and will affect fire behavior in certain areas. Additionally, wildland fire in grazing lease areas could impact leaseholders through temporary but significant forage loss. Land ownership adjacent to the Stronghold District is a combination of tribally owned lands and lands held by individual Indians and non-Indians.

The Pinnacles and Cedar Pass Districts are bordered primarily by Buffalo Gap National Grasslands and private ranch land. The main land use on the National Grasslands is cattle grazing. Privately owned lands are intermixed with federal lands along the park boundary. There are approximately 53.5 miles of boundary with the U.S. Forest Service and 41.5 miles of boundary with private land in these two districts. The Stronghold District is entirely within the Pine Ridge Indian Reservation and includes grazing allotments administered through the Bureau of Indian Affairs (BIA).



## IV. WILDLAND FIRE MANAGEMENT STRATEGIES

### FIRE MANAGEMENT GOALS

The following Badlands National Park fire management goals support the park's resource management objectives:

***Goal 1: Reduce both the incidence and extent of human-caused fires by 20% within 15 years of approval of the park Fire Management Plan.***

- Prevent unplanned human-caused ignitions through a cooperative fire prevention program aimed at the park visitor, staff and neighbors.
- Minimize the occurrence of unwanted (human-caused) fires through reduction of hazard fuels by prescribed fire and/or mechanical treatment (limited mowing around buildings) in and around developed areas and along park boundaries.

***Goal 2: Restore fire to 80% of the vegetated landscape within 15 years of approval of the park Fire Management Plan.***

- Perpetuate, restore, replace or replicate natural processes to the greatest extent practicable.
- Allow wildland fire use within the constraints of policy (DO-18) and the Environmental Assessment for the Fire Management Program of Badlands National Park.

***Goal 3: Restore fuel and vegetation mosaics to pre-European contact conditions on 25% of the landscape within 15 years of approval of the park Fire Management Plan.***

- Create and/or maintain defensible wildland fire use boundaries.
- Reduce dead fuel loadings (litter/duff) of 1.5 - 2 tons per acre by 60% or more in each fire use event. This is one of many fire effects which will be measured and tracked through the NPS fire monitoring protocol.
- Where applicable, restore fuel loads and plant community structure and composition to ranges of natural variability comparable to pre-European settlement using prescribed fire and wildland fire use. Prescribed fire is an integral tool for managing prairie ecosystems. Implemented with a "patchwork" approach to planning burn areas, the prescribed fire program will replicate historic fire occurrences in areas outside the wildland fire use treatment area, as well as within if a need is identified. The intention of the park is to reintroduce fire into all areas of contiguous-mixed grass prairie (where feasible) in an effort to replicate that ecosystem's historical fire return interval of 5-25 years (Wright and Bailey, 1980). A prescribed fire sequence has been developed that is intended to mimic this natural fire cycle. Approximately 4,000 acres of grasslands will be burned in the park each year through prescribed fire projects varying in size from 190 to nearly 5000 acres (Appendix H(1)). Repeating this burn cycle will yield a 15-year fire return interval.
- Minimize the occurrence of unnaturally intense fires through reduction of hazard fuels by prescribed burning. Mechanical treatment is unlikely to play a major role in this predominately grassland ecosystem, although some minimal mechanical treatment *may* be necessary to retain woody draws and juniper slumps.



- Train park staff to conduct safe, objective-oriented prescribed fires and wildland fire use consistent with *DO-18* requirements.
- Provide opportunities for public understanding of fire ecology principles, smoke management, and wildland fire program objectives.
- Monitor and evaluate the effectiveness of the prescribed fire program.
- Encourage research to advance understanding of fire behavior, effects, ecology, and management.
- Establish a database on the long-term effects of wildland fire on vegetation and other resources in the park. Utilize the results from the fire effects monitoring program to refine/adjust burning prescriptions to better meet the objectives of the hazard fuel reduction and prescribed fire programs.
- To control exotic grasses, the park will need to adjust its current burning strategies. Prairie restoration may require increased frequency of prescribed fire. Some areas may even require burning in three consecutive years. To control cool season, exotic grasses (bromes and bluegrasses) the park will need to burn in early spring instead of late spring. It is recognized that this "out of season" burning will be necessary to prepare some areas for "in season" burning, promote native species, and allow for wildland fire use in other areas.
- Control areas will be established in representative examples of park vegetation types where wildland and prescribed fire may be excluded if possible. Location and methodology for these control plots will be added to this plan as an appendix at a later date. These areas will be long term study areas for comparison to fire effects.

***Goal 4: Incur zero fatalities and an injury rate no higher than the national NPS average in association with wildland fire management activities.***

- Provide for the safety of park visitors, neighbors, and employees during all phases of wildland fire management operations.
- Suppress all unwanted wildland fires in the park and in the interagency mutual aid zone. All suppression efforts will be directed toward safeguarding life and property while protecting park resources from harm. All fires will be evaluated to determine the appropriate management strategy.
- Cooperate extensively with adjacent landowners through Memoranda of Understanding to facilitate safe and prompt suppression of unwanted wildland fire. Promote an interagency approach to managing fires on an ecosystem basis.
- Manage all wildland fire with minimum cost, environmental and cultural resource impacts.
- Provide opportunities for public understanding of the wildland-urban interface problem.

***Goal 5: Limit impacts from fire suppression activities to less than 5% of the estimated monetary value of the impacted resource.***

- Suppress unwanted fires commensurate with values at risk.
- Use minimum impact fire suppression techniques and rehabilitate disturbed areas to protect natural, cultural, wilderness and scenic resources from adverse impacts attributable to fire suppression activities.
- Engender understanding among park staff and firefighters about the impacts of fire



suppression on sensitive park resources.

- Ensure that a resource advisor is present on all major suppression actions.

More specific objectives related to individual vegetation types may be found in the Badlands Fire Monitoring Plan (*Appendix F*).

## WILDLAND FIRE MANAGEMENT OPTIONS

At Badlands National Park, with its predominately grassland vegetation communities, fires are generally fast-moving, short in duration, and intensive fuel reduction is not necessary. Also, with the extensive, sparsely-vegetated badlands formations coursing through the park, natural firebreaks make fire management considerably less difficult than in the open prairie found throughout much of the rest of western South Dakota.

In general, wildland fire management options available and suitable include suppression of human-caused fire (usually along park roads from catalytic converters or discarded cigarettes), use of prescribed fire for areas of continuous prairie across the park boundary, and wildland fire use (lightning-caused) where badlands can provide suitable firebreaks to prevent fires from getting too large or crossing the boundary.

In general, fuel reduction beyond prescribed fires for resource management objectives is not viable in the park. Grassland fuels regenerate quickly after a fire and do not build significantly after two to three years post-fire. Manual fuel reduction along the boundary, via mowing, is also not a viable option because of rough terrain, the need to repeat nearly annually, potential to aid non-native plant invasions, and aesthetic impacts on the native prairie.

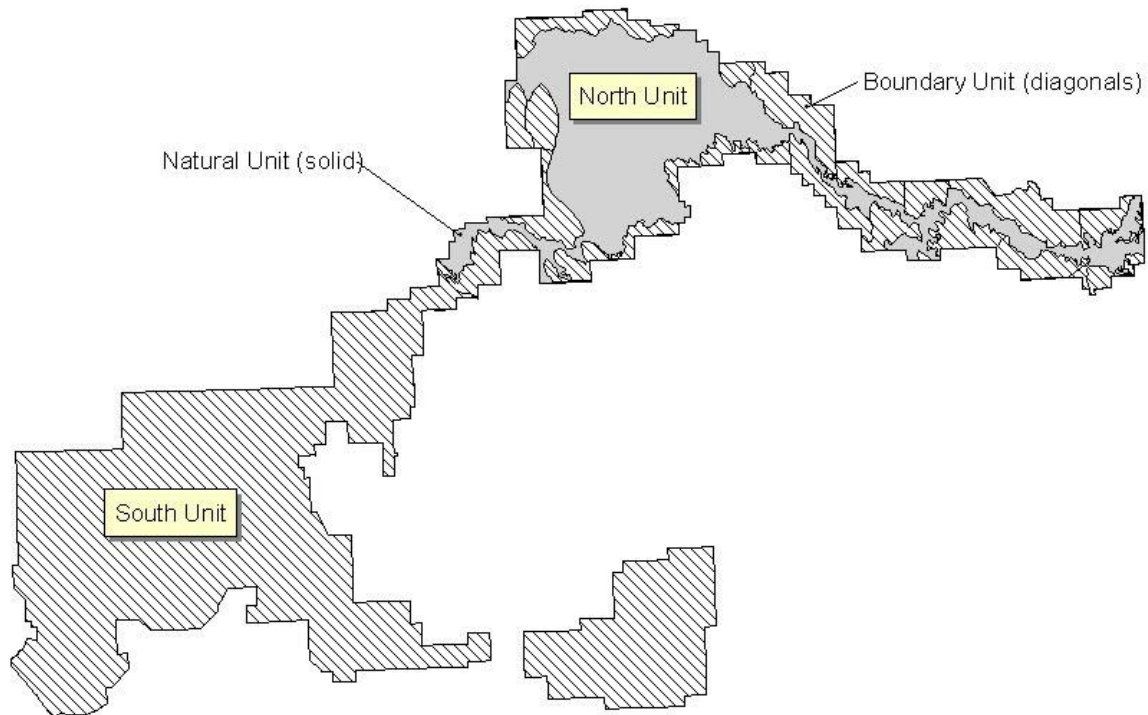
## PARK FIRE MANAGEMENT UNITS

Under the 1996 Badlands Fire Management Plan, the park was divided into three "Fire Management Units" (FMU), each with different management objectives. Only FMU 1, all non-Wilderness in the North Unit, provided for prescribed fire, and none of the FMUs allowed wildland fire use.

For the purposes of this Fire Management Plan, in order to bring the park into compliance with NPS policy, the park is divided into two Fire Management Units, a "Boundary Unit" and a "Natural Unit" (see **Fig. 3 below**). These units are delineated along administrative and natural barriers representing locations suitable for defensive fire tactics. A FMU is defined as any land management area definable by objectives or features that set it apart from the management characteristics of an adjacent FMU. FMUs may also have pre-selected strategies assigned to accomplish land management objectives. Within each FMU, prescribed fire units are delineated (see **Fig. 4 below**). In Badlands National Park the Natural FMU has four identified prescribed fire units with the remainder in the Boundary FMU. Prescribed fire units simply delineate the geographical extent of each planned prescribed fire treatment. The two Badlands National Park FMUs will be used to drive fire management actions in various areas of the park. The Natural FMU will be managed with a combination of wildland fire suppression, prescribed fire, and wildland fire use, while the Boundary FMU will only utilize suppression and prescribed fire. Aggressive firefighting strategies and tactics will be employed for all wildland fire occurring as the result of human ignitions. The appropriate management response will be determined and utilized for all wildland fires occurring in the Natural FMU. Prescribed fires will be implemented in both FMUs when it has been determined that they can successfully accomplish the desired resource objective.



**Fig. 3: Badlands National Park Fire Management Units**

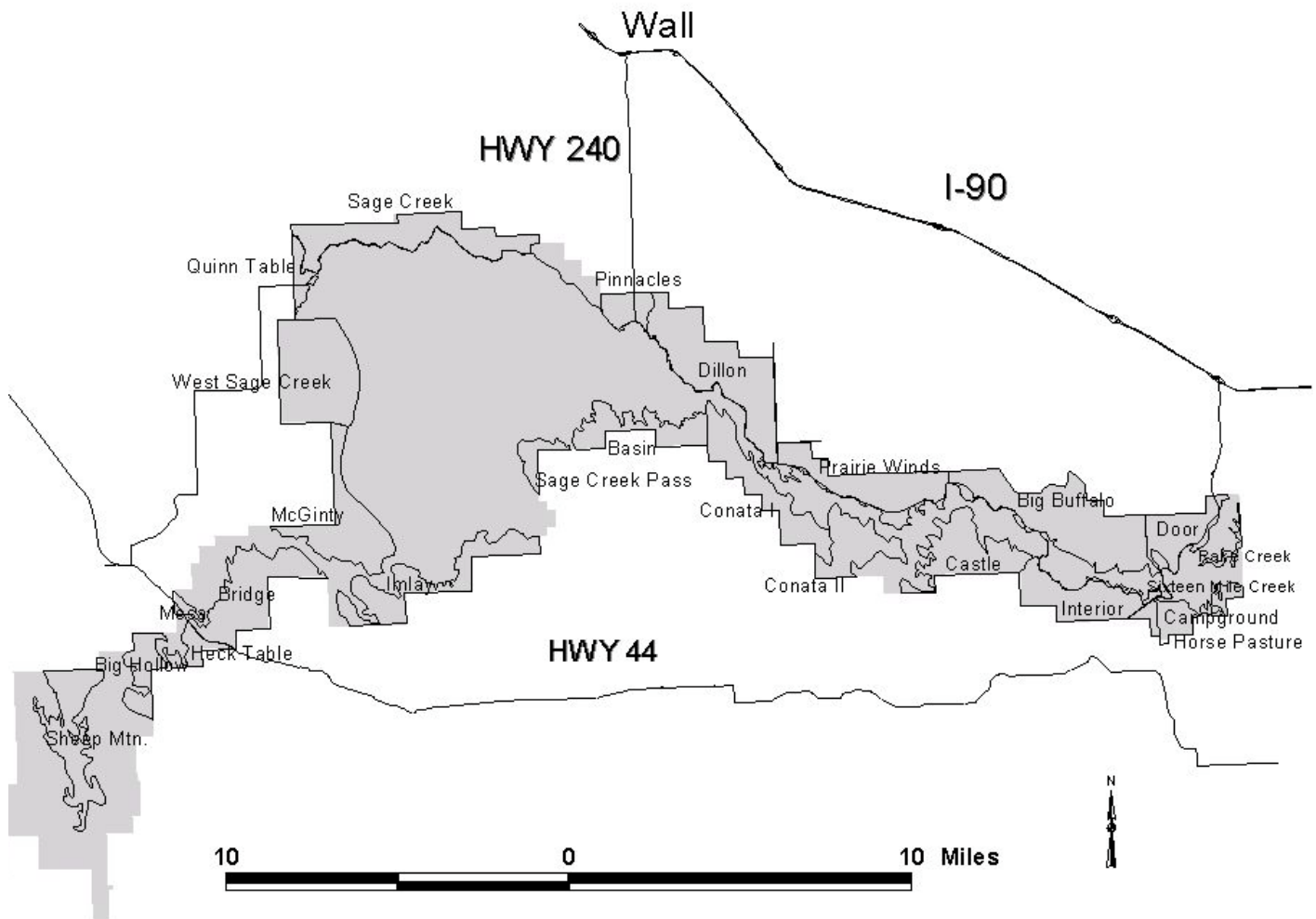


Within the two Fire Management Units of the park, the Boundary Unit and portions of the Natural Unit have been divided into twenty-seven Prescribed Fire Units as illustrated in **Fig. 4**. The annual burn acreage accomplishment within the Natural FMU will not exceed 10,000 contiguous acres for all wildland fire types (suppression, prescribed fire and wildland fire use acres combined). This acreage limitation is directly tied to ungulate populations and ensures adequate forage during the winter season. This acreage limitation does not include suppression and prescribed fire acres burned within the Boundary FMU. The prescribed fire accomplishments within the Boundary FMU will be nearly 4000 acres per year averaged over fifteen years. Each of the prescribed fire units has been placed in a burning cycle based on past burns, as well as on park needs and objectives. Boundaries for the prescribed fire units were decided upon by using aerial photography and GIS vegetation maps to determine physical barriers (badlands/roads). Further refinements in prescribed fire units may be made in development of individual Prescribed Fire Plans for individual units.



**Fig. 4: Badlands Prescribed Fire Units**





Due to current fire hazards, the relatively small size of park, the fuel types, associated rates of fire spread, historic fire duration, park staffing, and budget limitations, this plan utilizes a combination of appropriate suppression responses, wildland fire use, and prescribed fire for resource objectives as fire management tools.

Badlands National Park may take immediate, initial attack suppression action on fires within one mile of the park boundary, depending on the wind direction and local agreements. It is the intent of Badlands National Park fire management to allow natural ignitions occurring within areas where fire poses minimal threat to life, property and resources to play out their revitalizing role within the grassland ecosystem and, ultimately, reestablish a natural fire regime.

## HISTORIC ROLE OF FIRE

- **Fire Ecology**

With large tracts of continuous, fine fuels, frequent periods of hot, dry weather, and recurrent lightning, the mixed grass prairie in and around the park represents a classic grassland fire regime. Historically, frequent, low-intensity surface fires with a return interval of 1 to 25 years typify this ecosystem (Pyne, et. al. 1996). The effect of this is exemplified in the composition of



plant and animal species. The extent of species diversity can be directly related to the fire return interval. The randomness of the fire mosaic often determines species location and dispersal. The earliest notations of fire in this ecosystem are detailed in the accounts of explorers, trappers and settlers. These records indicate a high occurrence of both natural and anthropogenic ignited fire (Pyne 1982). The importance of disturbance in this ecosystem is paramount. Fire, drought, flooding, erosion and animal grazing all should be present to offer the greatest potential for disturbance in the system.

The effect of fire in prairie grasslands is complex; thus ecologists hesitate to generalize. Fires can increase the number of species, especially annuals, or they may create monotypes, or permit invasion by short-lived perennials, weeds, or aggressive exotics. Seed production, germination, and seedling establishment of both annuals and perennials are commonly encouraged by fire. Since perennials, such as most exotic species, are capable of vegetative reproduction, they often survive fires. There is no doubt that fire restricts shrub and tree growth. In the Badlands, trees and shrubs most often survive in rocky breaks and draws, where fire would not penetrate. Frequency, intensity, and especially timing of burning are thus extremely important.

- **Fire History**

Examining the fire history of the region gives us insight as to the processes that have determined the past and current vegetative patterns. Ultimately, it is this view of fire over time that should guide fire use in the park. Development of prescribed fire prescriptions necessary for the restoration and maintenance of vegetation cover types to preparedness conditions can be guided by this standpoint.

Fire represents an ecological factor of significant importance in the development and structure of nearly every terrestrial ecosystem in North America. It has been present in natural ecosystems since the origin of climate on earth (Wright and Bailey 1982). It has been well established that the plains ecosystem has historically experienced frequent, fast running, short duration fires. From the recorded accounts of early European explorers and settlers, fires were a common occurrence on the plains (Higgins 1986). Fires were often ignited by lightning activity during the late spring to early autumn season. The writings note that the plains were often on fire as a result of Indian activities, e.g., to signal others, to herd game, to alter vegetation composition, and to clear campsites. Following the influx of European settlers in the mid-to-late 1800's, most human-caused prairie fires resulted from the carelessness of cowboys and cooks, rather than Indians (Wright and Bailey 1982).

The historical prevalence of fire on grasslands cannot be denied. Fidler, who observed fires in the fescue grassland of southwestern Alberta in 1793, wrote in his diary:

These large plains either in one place or another is [sic] constantly on fire and when the grass happens to be long and the wind high, the sight is grand and awful, and it drives along with amazing swiftness. The lightning in the spring and fall frequently lights the grass, and in winter it is done by the Indians ... these fires among the long grass is very dangerous. (Pyne 1982)

In the early 1800's, Lewis and Clark and later Charles Fremont wrote of fire on the Great Plains, which one explorer referred to as "these conflagrated prairies" (Pyne 1982). Early ecologists variously perceived of grasslands as climatic climax or fire climax situations. Wright and Bailey (1980) felt that climate is the dominant influencing factor of North American grasslands, though fire, ungulate grazing, insects, and rodents do also. Pyne (1982) builds a strong case that anthropogenic fire has maintained grasslands as a cover type, from the Great Plains to the African Savannah, he states that "fire and grass are genetically associated." The adaptations of grass to fire and drought are much the same, indicating an intrinsic link between climate and fire



occurrence.

There are few reliable records of fire frequencies in the Great Plains grassland due to the lack of trees to carry fire scars and from which to collect tree-ring data. We know that fire frequency was high because explorers and settlers were concerned about the danger of prairie fires. Pyne (1982) also states that fires came with summer thunderstorms in a natural fire regime. After anthropogenic fire became dominant, the summer lightning cycle was superseded by a pattern of spring and fall burning.

Fires have always been common on the prairies during drought years. Fires on the prairie were often measured in terms of millions of acres or square miles; however, today they are broken up due to land ownership and fire suppression. A variety of sources indicate that fire frequency in pine forests varies from 1-25 years (Pyne 1996). From these sources we can extrapolate fire frequency data from forests that have grassland understories. Wright and Bailey (1980) believed that fire frequency in prairie grasslands is on the order of 5-10 years.

On the upper and lower prairie of Badlands National Park, it is difficult to determine how much fire has historically been anthropogenic or natural, but fires would likely have been large and fast moving. In the late 1800's when all the prairie between the Cheyenne and Missouri Rivers was on fire, cattlemen brought their herds into the Sage Creek area of the badlands because natural barriers, the wall, and extensive prairie dog towns limit the size of fires in that area.

Ignition of grassland fires has been caused by early and modern man, lightning, spontaneous combustion, sparks from falling rock, and volcanic eruptions. Pyne (1982) argues strongly that fire was anthropogenic across the prairies, used for centuries by Indians. The fire techniques adopted from the Plains tribes were suitable for trappers, hunters, explorers, and military expeditions. As European settlers supplanted the Native American users of the Great Plains, fire and the native prairie grasses were largely eliminated in favor of livestock grazing and domestic cereals. This situation typifies much of the grassland, which today lies within Badlands National Park. On the upper and lower prairie, it will be nearly impossible to determine how much fire was anthropogenic or natural.

The main source of natural ignitions in the park is lightning. Lightning ignition is produced when cloud-to-ground discharges occur without precipitation, when lightning precedes precipitation, or when it produces fires beyond the range of the usually local thunderstorm showers. Lightning fires often persist despite rains, and grasslands thoroughly soaked by rain can often burn after just a few hours of drying winds and/or sun.

With the exception of prescribed fires, Badlands National Park has had an average of three fires per year, with a total of 97 fires recorded from 1974 through 2003 (*Appendix E(5)*). Of those fires, lightning caused 60% of all ignitions. Generally, lightning fires, if not suppressed by humans, are extinguished by rain at less than 2 acres or pushed to 100-acre size by gusty winds associated with thunderstorm activity. Several times during a summer, dry lightning storms, high winds, and dry fuels combine to produce multiple ignitions, stretching initial attack forces to the limit. Two lightning-caused fires in the Badlands Wilderness in late April of 1988 (White Butte and South Fork Fires) required use of a Type II Incident Management Team. Together, the two fires totaled 170 acres in size. Generally, fires do not exceed one burning period due to the effect of evening moisture recovery on fine fuels. Human-caused and unknown ignitions accounted for the remainder of all documented fires and were recorded from all months.



## WILDLAND FIRE MANAGEMENT SITUATION

- **Historical Fire Weather Analysis**

Fuel moistures are at their maximum for live woody and herbaceous plants during the spring when plants are actively growing (see graph, *Appendix E(4)*). Dead fuel moistures in large size classes reach minimum values during the late summer and fall months (see graph, *Appendix E(4)*). Indicators of fire danger as computed through the National Fire Danger Rating System (NFDRS) show that fire danger is highest when fuel moistures are lowest and when plants are not actively growing (see graphs, *Appendix E(4)*). On-site weather observations are made at two remote automated weather stations within the park. The Cedar Pass Station (#394184) adjacent to park headquarters has the most historical data, but was removed in 2000. Originating as a manual station, the earliest fire weather records are from 1982. Other, more recently installed stations, include Pinnacles (#392602) installed in 1995 and White River (#395201) installed in 1996. Both are adjacent to the respective Ranger Stations.

- **Fire Season**

The fire season at Badlands National Park is April through October. Over 95% of all wildland fire starts recorded at Badlands between 1974 and 1998 occurred during this period (*Appendix E(5)*). April through October represents the time from before spring green-up until after curing has occurred, and when climatic conditions favor ignition. Green-up is signified by the accumulation of new grass growth that significantly retards fire spread. This occurs when the live-to-dead ratio of new grass to thatch exceeds 1:1, usually in mid-May. The bulk of the rainfall occurs in May and June, but severe thunderstorms from June through August are responsible for most lightning-caused fires. Anthropogenic fires were recorded virtually year-round between 1974 and 1998. The abundance of cured, light flashy fuels on the prairie dictates that a minimum state of readiness be maintained year-round (see **Table 1**, pg.11).

- **Fuel Characteristics**

Badlands National Park is mostly mixed-grass prairie. The wildland fuels are best characterized by the National Fire Danger Rating System (NFDRS) fuel model L. This system has been altered historically by grazing and the influx of non-native grasses such as Japanese brome, wild oats, and cheatgrass. Predominant natives include Western wheatgrass, several bluestems and gramas, and needle-and-thread grass. Woody plant communities occur among the canyons of the Badlands wall, and along springs, streams, stock ponds, and geologic slumps. The woody draws, which provide valuable shelter and browse for wildlife species, are typified by green ash, American elm, juniper, sagebrush, cottonwoods, and a variety of shrubs. These woody draws are best characterized by NFDRS fuel model T.

Numerous intermittent creeks, badlands features, and the dominating badlands "wall" create many natural barriers to fire spread. Agricultural use and grazing on adjacent lands create firebreaks to fire spread during portions of the year. The north and west boundaries of the park are dominated by areas of continuous stands of grasslands which have the potential to carry fire and escape park boundaries. The rugged, remote nature of the topography requires specific "local" knowledge of access routes for fire suppression activities throughout the park and adjacent lands.

Grassland fuels burn rapidly. Most grassland plants are surface deciduous, with the aboveground portions dying back at least once a year. As a result, grasslands are particularly vulnerable to fires as standing plants dry and cure to ground level. Most grassland species are xerophytic, often with stiff, scabrous leaves and rigid stems whose structure may be aided by



high silica content. Shoots produced after a fire have also been found to be stiffer and more erect than shoots emerging in areas not recently burned. Their rigid and erect nature and behavioral adaptations not only help to keep stem and leaves upright even after growth terminates, but also expose the grassland understory and soils to sun and wind. This results in ideal combustion conditions and finely divided fuels with numerous air spaces that permit further drying, as well as abundant oxygen for burning. Compaction of grassland fuels is nearly always conducive to fire propagation, yet seldom reaches the degree attained by heavier fuels, even after heavy snows, rains, or inundation.

Because of these characteristics, conditions are not usually conducive to the rapid decomposition of plant materials by bacteria, fungi, and soil invertebrates in prairies. Therefore grassland plant debris often accumulates faster than it decomposes, with variations in decomposition rates being largely determined by temperatures, amount of rainfall, and the moisture present in the litter. Accumulation not only results from slow breakdown of plant materials, but from the rapid and prodigious growth characteristic of many grassland plants, with entire plant tops being added to the litter layer at the end of each growing season.

The rapid growth, accumulation, the slow decomposition rates, the chemical and physical composition of grassland plants, and the highly flammable nature of the plant debris point to a vegetation type that can readily burn. Grasslands that can be readily and repeatedly burned have apparently evolved with fire, becoming dependent upon it as the primary decomposition agent and key nutrient recycling path. At the same time, the grassland plants create conditions that make fires almost inevitable.

The physical nature of grassland fires is simple in comparison to fires in more stratified vegetation types. Rapidly moving head fires consume most of the vegetation and often develop broad fronts because of the continuity of the fuels and the level to rolling terrain usually associated with grasslands. These fire fronts tend to become irregular in outline as topography, fuel loads, winds, natural barriers, and developing convective columns speed up or retard movements. Head fires in dense fuels and tall grasslands often generate large flames, but produce little spotting as most grassland fuels are consumed too quickly and thoroughly. Further affecting fire behavior, is the greenness stage of the current year fuel load. Green-up of cool- and warm-season grasses is dependent on precipitation and soil moisture. Drought years often produce no green-up for the entire year. Year-to-year variations in the timing of green-up and curing of grasses affect fire danger throughout the growing season (see **Table 1**, pg. 11). Fire behavior is significantly reduced immediately after green-up. Rates of spread increase dramatically, as the vegetation cures. Due to the normally high rate of spread and short residence time after grasses cure, long-lasting effects to soils (e.g. hardness, composition, and hydrophobicity) are few. Key nutrients supplied by the fire's potash are quickly recycled into grassland communities, since soil properties are unchanged.

The woody draws found mostly on north and east slopes and slump areas found on a variety of slopes and aspects are generally less than 40 acres. They can change a fire's spotting potential, rate of spread, and fire intensity. Monitoring and experimental burning are needed to better understand fire behavior in these pockets of woody vegetation.

- **Control Problems**

Control problems can be expected on fires burning in the peak fire season. When continuous fuels and warm, dry, windy environmental conditions are encountered, high fire intensities and rapid spread rates can be achieved within a short time. In these situations, firefighter safety may dictate use of indirect attack suppression methods.



Many areas within the park present hazardous conditions, such as steep slopes with unstable footing, densely wooded draws, and continuous fuels. Suppression activities in such areas must be carefully planned and executed.



## V. WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS

### GENERAL MANAGEMENT CONSIDERATIONS

- ***Endangered Species***

The park hosts both State and Federal listed threatened and endangered species that will be considered before any fire management activity takes place (*Appendix C*). Most notable of these is the black-footed ferret. A reintroduction project for the ferret has been ongoing in the park since 1994. Additionally, the ferret's only prey, the prairie dog, was recently considered for Federal listing. It was rejected largely due to a lack of resources for enforcement. A statewide management plan for the prairie dog is expected in the near future, which may impact wildland fire planning in the park. Anecdotal evidence indicates prairie dog towns often increase in size after a fire burns adjacent to the town. The prairie dog towns themselves are highly resistant to direct impacts from fire, due to the lack of vegetation. The fire management program will be within the constraints of the Endangered Species Act of 1973, as amended. A review of the list of threatened and endangered species indicates that no significant impact will result from transient fire.

- ***Locally Rare Plant Communities***

Badlands National Park is dominated by a few vegetation communities, all of which are fire dependent. However, the vegetation mapping completed in 1999 revealed a number of communities that occupy less than 1% of the park (Von Loh, et al, 1999) and should be given careful consideration in any burn plan or suppression activity.

- ***Cultural Resources***

Badlands National Park lies in the Plains Culture Area. Archaeologists have defined the Plains Culture on the basis of the character of material remains from prehistoric sites and have outlined a sequence of changes in those remains. Documentation of these changes in association with materials that can be dated using absolute dating techniques (e.g., radiocarbon) has allowed archaeologists to assign a general time frame to variations in the material culture. Using these and other techniques, a broad sequence of culture history has been defined for the region and divided into four periods and/or cultural affiliations: Paleo-Indian (11,500 to 8,000 BP), Plains Archaic Tradition (8,000 to 1,500 BP), Late Prehistoric Period (1,500 BP to 1700s), and Protohistoric/Historic Period (1675 to 1920s). The Archaeology of Badlands National Park, South Dakota (Hannus, et.al. 2003) notes:

No archaeological cultures, phases, or complexes have yet been delineated that call the Badlands "home". The White River Badlands, although centrally located within the "Plains Region," are generally understood as peripheral to many culture areas. This view implies a transitory or seasonal use of the region rather than year-round settlement.

Currently 10% of the land area within the Pinnacles and Cedar Pass Districts has been surveyed for archeological resources. Fieldwork for this survey was completed in 2000 as part of a 5-year study being conducted jointly by Augustana College and the NPS Midwest Regional Archeological Center (MWAC). A draft this report has been reviewed and the final is expected during summer, 2003. Prior to this survey, less than one percent of the total land area within the park had been surveyed for archeological resources. Less than 1% of the Stronghold District



has been surveyed for archaeological resources. Most of the prior archeological surveys conducted in the park (Beaubien, 1953; Taylor, 1961; Britte, 1970; Kay, 1974; Falk, 1976; and Anderson, 1978) have been on a specific project-related basis in response to construction needs. The only exception to this is Britte's (1970) study at Site 39JK2. Two hundred eighty-three sites have been identified as of January, 2001. Site types are primarily lithic and artifact scatters. There are two identified historic farmsteads and two structures with wooden remnants. However, due to homesteading in the early 1900s, scatters of historic materials dot the prairie landscape, particularly in the Sage Creek area; 236 sites have fair to good documentation on file while 47 are considered poorly documented.

All archeological sites within the park are protected by federal legislation (Antiquities Act of 1906, 1979 Archeological Resources Protection Act, Executive Order 11593), Section 110 of the National Historic Protection Act and their management is guided by *NPS-28: Cultural Resource Management Guideline*. Further survey and evaluation of the park's archeological resources may also yield archeological remains that warrant future nominations to the National Register. To date, only one site has been evaluated for nomination to the National Register; however, it is ineligible due to impacts from the Badlands natural erosion which destroyed the integrity of the site. The research conducted by Brent Buenger in 2000 and 2001 determined that the short, superficial duration of prescribed fire presents only a minimal risk to archaeological sites. The primary impacts will result from off-road vehicle travel to support fire activities.

Research has been conducted on the impacts of fire on archaeological resources. In 2002, Brent Buenger, a Phd. Candidate at Colorado State University in the Department of Anthropology, submitted *Fire Effects on Archaeological Resources During Prescribed and Wildlife Fire in a Prairie Ecosystem (Badlands National Park, Wind Cave National Park, Rocky Mountain National Park)* and determined:

Prescribed burning in grassland fuels produced relatively low temperatures and residence times. Surface temperatures recorded during a May, 2001 burn ranged from 418.8C to 61.6C. The maximum subsurface temperature was 34.6C. The investigator's findings indicate that thermal alteration of the artifacts placed within the test plots was not significant. The majority of discoloration was due to residence deposits, the byproduct of organic combustion, present on all of the artifacts. No significant damage in the form of cracking, spalling, or deformation occurred. Even the wooden objects showed only minor effects of the fire. Based on these observations, it is suggested that prescribed burning in mixed grass fuels.

Secondary impacts are created by erosion and vandalism. The severity of fire-related effects can be controlled and diminished to some degree by controlling the fireline intensity at the time of the burn. Fire suppression and prescribed fire activities involve construction of black-line and scratch-line, use of swatters, and direct attack with water, all primarily in fine fuels. Ground disturbance is minimal and not likely to adversely affect archaeological resources.

#### Cultural Landscapes:

The park has not yet been inventoried for cultural landscapes. Identified potential cultural landscapes are:

- Historic fossil collecting camps. The location of these camps is approximated from journals and field reports but have not been pinpointed.
- Fort Pierre to Fort Laramie Road. Documented in a masters thesis in 1975.
- Route of Bigfoot's Band through the White River Badlands to Wounded Knee. Location approximated from oral histories.





- Stronghold Table. Ghost dances held here in 1890 contributed to the events of Wounded Knee and are the last known such ceremonies of the 19<sup>th</sup> century.
- Cedar Pass Headquarters Area. Currently under evaluation through a Cultural Landscape Report and Environmental Assessment due to be completed in 2004.

#### Historic Structures and Sites:

In 2002, the Ben Reifel Visitor Center was determined to be eligible for the National Register of Historic Places as a part of the plans to rehabilitate the Center. Consultation with the State Historic Preservation Office resulted in an approved construction plan with mitigation measures specified.

In 1975, the State Historic Preservation Office determined that the Cedar Pass Lodge was ineligible for the National Register of Historic Places due to extensive alteration to the structural integrity and external appearance of the cabins and lodge buildings.

The List of Classified Structures for Badlands National Park was last updated in 1992 and requires updating. It lists three roads (Badlands Loop Road, Sage Creek Rim Road, and Sheep Mountain Table Road) and two structures (Tyree Gravesite and Homestead Well). Both structures are located within the boundaries of the Badlands Wilderness Area.

#### Ethnographic Resources:

American Indians use many areas within the park as spiritual sites. Activity at these sites usually consists of small offerings (often small packets of tobacco) tied to a tree or bush. Park staff is aware of the general areas where such activities take place. The park may have potential ethnographic landscapes as yet unevaluated.

#### • ***Paleontological Resources***

To prevent the potential crushing of fossil remains, no vehicle traffic will be allowed in badlands areas associated with a burn. Areas recommended for hand lining, trenching, and heavy equipment operation must first be reviewed by the Park Paleontologist and approved by the Park Superintendent.

Due to the extreme surface temperatures associated with grassland fires (Lata, 1997), paleontological resources exposed at the surface may undergo splitting and cracking when exposed to fire. Due to the buffer created by overlying bedrock, fossils in the subsurface are probably not impacted by fire. Most of the research on fossils and temperature changes have been completed in museum and not field settings (Collins, 1995; Johnson, E.V. and J.C. Morgan, 1979; Thomson, G. 1986; Brunton, C.H.C. et al. 1985; Howie, F.M.P., 1978, 1979; Stollow, N., 1966; Ashley-Smith, J., 1987). It appears that temperature changes relate directly to moisture content within the fossil specimen. When moisture within the specimens increase in temperature, the specimen will begin to expand and crack. Field studies involving surface temperature changes and exposed fossils will be implemented during the spring and fall burn seasons of 2000. Temperature probes and/or thermal sensitive paints will be installed in Badlands Areas partially covered with vegetation directly adjacent to burn areas. Photos will be taken of fossil bone before and after the burn event to record any fire-related damage.

As a regular practice, because of the potential impact on exposed fossil resources, pre-burn surveys and potential removal of fossils will be implemented before a prescribed fire is begun. Careful considerations will need to be made on the scientific significance of specimens found and the type of fire that will come in contact with the specimens. If a significant site is found, the site will be protected from fire encroachment or excavated.



- **Wildlife**

Generally, the direct impacts of fire on wildlife include dislocation and mortality of individuals or groups of individuals. The park's larger mammalian vertebrates (deer, bison, bighorn sheep, pronghorn, coyote) will generally move away from fire. However, the availability of adjacent suitable habitat is important for local populations and is a critical factor in Badlands National Park for the fenced bison populations. A large wildland fire in the Sage Creek Basin during drought conditions or late in the growing season could significantly reduce the forage base needed for the bison herd. Potential for bison escape could increase, overuse of existing range could occur, and the park may be forced to conduct emergency round-up operations to adjust herd size.

Deer, pronghorn, and bison appear to favor areas that have been burned and where green-up has occurred. Observations indicate that the new vegetation sprouting from burned areas is the attraction. Some problems, such as overgrazing, soil compaction, and concentrations of wildlife near roadways, may arise from this behavior if small plots are burned.

Fire in the mixed-grass prairie has been shown to favor bighorn sheep, bison, deer, and other mammals (Coppock and Detling, 1983). A survey of the Badlands National Park bighorn sheep herd conducted by McCutcheon in 1980 concluded that prescribed fire would release stored nutrients for grass production presently tied up in decadent grass stands and litter within bighorn range. Research concerning the effects of fire on wildlife can be reviewed in the *Annotated Bibliography: The Effects of Fire on Mixed Grass Prairie*, prepared by Wisenart, and the park's general annotated bibliography.

Coppock and Detling (1986) found that bison grazing pressure decreased in prairie dog towns with increased use of nearby burned areas, suggesting that prescribed burns could be effective in mitigating bison impacts on colonies. There is anecdotal evidence that burning in or around prairie dog colonies may increase their size, benefiting not only prairie dogs, but possibly their natural predators, as well, like the black-footed ferret. More research is needed to determine if burning may benefit these two species of special interest.

Park resource managers realize the Badlands National Park ecosystems are altered through human activities. Uncontrolled wildland fire has potential for negative impacts at the landscape level. Conversely, fire under the correct prescriptions can be used as a tool to improve habitat. For a more thorough discussion of Badlands National Park flora, fauna, their habitats and the effects of fire see *Appendix D*, the Environmental Assessment, and *Appendix E(4)*, which discusses park fire ecology.

- **Water Availability**

Water supplies for fighting fires are basically limited to park water systems and the park water tender. There are a few wildlife impoundments throughout the park, with the majority concentrated in the Badlands Wilderness Area. These reservoirs, in general, are not large enough to be of any assistance in a wildland fire situation and are critical to wildlife. Cedar Pass' water supply is the West River/Lyman Jones pipeline from Kadoka, which will eventually be supplied by the Missouri River. Pinnacles is currently connected to the water system utilized by the town of Wall, SD. At the ranger station, there is a 20,000-gallon sealed reservoir with a 2,000-gallon residual. The White River Visitor Center is connected to the Mni Wiconi rural water pipeline.

- **Equipment**

As of 2004, the park has two Type 6 wildland engines and one Type 2 structural engine in operation. One Type 6 and the Type 2 engine are generally stationed at Cedar Pass and the



other Type 6 is at Pinnacles. The park has sufficient supplies to equip a crew of ten firefighters. There are also four chainsaws, two Mark III pumps, and a floto-pump. A 6,000-gallon water tender is located at the Cedar Pass Maintenance area. In 2002 the park and FIREPRO split the cost of a used 1998 Kenworth semi-tractor trailer to pull the tender. In 2003 FIREPRO funded a ¾ ton diesel crew cab pickup for fire crew use, and an ATV. The park's Resource Management (RM) Division and Resource Protection (RP) Division also have ATV's available for use on fire. RM has two ATV-mounted sprayers available for use.

- **Facilities**

In 2003 the park utilized FIREPRO and Fee Program funds to construct a new fire station at Cedar Pass. This building has a 3-bay heated garage to house the structural engine and at least one wildland engine. In the bays there is also a workshop and tool/equipment storage. There are also a search-and-rescue cache room, a fire cache storage room and a weight room/storage room. There is also an office for the Fire Coordinator, a work area for fire planning and dispatch, and a training/meeting room. This facility is a great advancement for the park fire program.

- **Personnel**

The park currently has 50+ firefighters meeting minimum NWCG qualifications, including a three-person seasonal FIREPRO-funded fire crew and a permanent fulltime engine supervisor (Fire Coordinator position). Availability of qualified personnel is one area that can be a problem. Engine bosses (ENGB) and incident commanders (ICT4) for pre-suppression activities during preparedness levels 4 and 5 are a particular issue. The park has a commitment to have 4-5 qualified wildland fire personnel able to respond to fires, but that number is not always available at any one time and varies from year to year. The remoteness of some areas of the park can be an obstacle in getting personnel to a fire. This can create a delay in response time. See pages 56-57 of this plan for targeted staffing levels in support of fire management at Badlands National Park.

## **BADLANDS FIRE MANAGEMENT PROGRAM**

There are three basic components to the Badlands Fire Management Program: Wildland Fire Suppression, Wildland Fire Use, and Prescribed Fire.

### **Wildland Fire Suppression**

- **Wildland Fire Prevention Program**

A major goal of the park fire management program is to reduce the threat and occurrence of human caused wildland fires. The Fire Prevention Plan (*Appendix I*) seeks to accomplish this goal through an analysis of the risk of human caused ignitions within an area; hazards within that area; and values of resources found within that area. Prevention activities developed for specific areas include education aimed at park visitors, employees, and adjacent landowners; engineering (or the use of appropriate equipment, methods, and projects); and enforcement of regulations aimed at preventing human caused fires.

The Superintendent is responsible for overall fire prevention within the park and shall initiate prevention action as indicated within the park's Fire Prevention Plan. General activities identified through the analysis are summarized below. Detailed information can be found in *Appendix I*.

Educational activities will focus on educating park visitors and adjacent landowners about fire



prevention regulations, appropriate prevention activities, and current fire danger ratings using media, signs, and verbal contact. Educating park employees about integrating fire prevention activities into their jobs is a continuing responsibility of the fire program staff, as is the development of appropriate fire prevention messages for park neighbors.

The Park Fire Coordinator or their designee will provide and maintain fire prevention devices (e.g., spark arrestor) on appropriate field equipment, inspect power lines or other potential sources of ignition on a yearly basis, and evaluate park structures for flammable construction materials and the need for hazard fuel reduction work.

Resource Protection Rangers will conduct routine patrols and enforce regulations regarding campfires, smoking, and other components of the Fire Prevention Plan, as appropriate.

- **Wildland Fire Preparedness**

Preparedness includes activities conducted before a fire occurrence to ensure the ability of the park's fire management organization to initiate effective action. This action may include the evaluation of the situation and selection of appropriate management response. Preparedness activities include recruitment, training, planning, and organization, fire equipment maintenance and procurement of equipment and supplies. The objective of preparedness is to have a well-trained and equipped fire management organization in place to manage all fire situations that confront Badlands National Park managers.

**Annual training:** All training and qualifications of wildland fire personnel are based on the standards developed by National Wildland Fire Coordinating Group (NWCG) and may be found in the *Wildland and Prescribed Fire Qualification System Guide PMS 310-1*. Employee qualifications are tracked and archived through the National Park Service Wildland Fire Management Qualification System found on the Shared Applications Computer System (SACS).

The park goal is to have fitness testing and physicals (when needed) for permanent employees completed prior to February 28<sup>th</sup> of each year and by June 15<sup>th</sup> for all others. Annual firefighter refreshers are held at Badlands (usually in April for permanent employees and in June for seasonals) as well as each of the Northern Great Plains parks.

Advanced training (series 200 and above courses) are coordinated through the Northern Great Plains Area Fire Management Office (NGPAFMO). Whenever possible, trainee assignments will be made to further develop skills.

Prior to and during the fire season, the Northern Great Plains Area Fire Management Office along with Badlands personnel will take the following measures to ensure adequate fire preparedness:

**January 1 - April 30:** Update and maintain accurate employee training and qualification records. Review Cooperative Agreements with surrounding fire management agencies. Prepare plans for any prescribed burn projects for hazard fuel reduction and resource management projects. Order fire cache supplies and replacement equipment as needed. Perform annual maintenance on fire weather station. Provide updates or changes to cooperators for local and regional mobilization plans. By March 15, the fire caches are ready for use and all engines will be in service. A formal inspection will be held on or around March 15. Suppression personnel will be fitness tested and protective gear will be available --- and both wildland engines are operational and properly stocked. Fire tools should also be in a state of readiness by being sharpened and available for use.

**May 1 - June 15:** Inventory fire supplies and equipment and update list. Inspect fire cache to ensure equipment is ready. Check operation of all slip-on and portable pumps. Outfit field



vehicles, all initial attack personnel, and interagency crew participants. Review fire weather station observation, recording, and weather station equipment maintenance procedures. Review established procedures for utilizing suppression and emergency preparedness accounts. Evaluate the need for basic firefighter training and conduct if necessary.

**June 16 - September 30:** Maintain state of readiness as identified in the Step-Up Plan (see **Table 2 below**). Test all slip-on units and portable pumps at least weekly.

**October 1 - December 31:** Critique fire season. Evaluate individual performance ratings of fire personnel and correct deficiencies and recommend training as needed. Review and revise Fire Management Plan as needed.

- **Wildland Fire Emergency Preparedness**

Emergency preparedness describes actions to provide extra capability during times of extreme or unusual fire danger caused by meteorological influences on the park's natural fuel complexes. Unusual occurrences will be addressed by planned use of emergency preparedness funds linked to the National Fire Danger Rating System (NFDRS) burning index and described in the Step-up Plan (see **Table 2 below**). The park's authority to expend emergency preparedness funds is detailed in *RM-18*. Appropriate actions for use of emergency preparedness funds include: hiring of temporary emergency firefighters; placing existing staff on extended tours of duty; increasing or initiating special detection operations; pre-positioning additional wildland fire resources in the park; and hiring fixed wing or rotary aircraft to accomplish necessary preparation. These are planned to ensure the capability of prompt response with adequate forces to whatever specific fire situation develops. Expenditures of these funds will be coordinated with the NGPA Fire Management Officer.

This Plan uses the Burning Index (BI), derived from the National Fire Danger Rating System (NFDRS) (Deeming et al. 1977), for basing determinations regarding the scope and extent of fire management activities. Depending on the BI derived from the daily NFDRS/WIMS data, predicted fire danger is classified as low, moderate, high, very high, or extreme. A set of staffing classes which have a corresponding set of actions that the park will initiate to meet potential fire danger has been developed and is presented in **Table 2** below as the Step-up Plan.

The 90th percentile Burning Index for Badlands National Park is based on fuel model L. The Park is a National Fire Danger Rating System (NFDRS) climate class two area (sub-humid with rainfall deficient during the summer) and averages a 107-day annual fire season from June 1 through September 15. Burning indexes utilized in development of Badlands National Park's staffing classes were taken from an historical analysis of fire weather observations archived for the Cedar Pass weather station (Station Number 394184). For these observations, the low fire danger rating equates with BI's ranging from 0 to 10; moderate equates with BI's ranging from 11 to 20; high ranging from 21-42; very high ranging from 43 to 51; and extreme with BI's of 52 and greater.

Actions taken under staffing classes I - III are funded through the normal park budget. Additional actions detailed under staffing classes IV - V can be supplemented by emergency preparedness funding coordinated through the Northern Great Plains Area FMO. Burning index, associated staffing classes, and designated prevention, detection, and preparedness actions to be taken with each level are discussed in the Step-up Plan below.



**Table 2: STEP-UP PLAN FOR BADLANDS NATIONAL PARK**

Staffing class	Burning Index	Actions
I (Low)	0 – 10	<ul style="list-style-type: none"> <li>♦ Prevention – Fire Prevention activities can be grouped into three categories: in-Park activities, out-of-Park activities, and coordination with other agencies. During low fire danger situations, in-Park activities will represent the majority of the prevention activities. Visitors, upon entering the Park, will be instructed to restrict vehicle travel to constructed Park roads only; to make no open fires except in designated campgrounds and picnic areas and only in existing, constructed fire places; and to totally refrain from the use of any fireworks or explosives.</li> <li>♦ Detection – Park personnel will carry out normally assigned duties.</li> <li>♦ Get Away Standard (the goal for the length of time required to staff an engine)– None</li> <li>♦ Preparedness – A minimum of one engine will be prepared for operation. Park personnel will carry out normally assigned duties.</li> </ul>
II. (Moderate)	11 – 20	<p><i>All Staffing Class-1 actions apply with further considerations noted below</i></p> <ul style="list-style-type: none"> <li>♦ Prevention - The in-Park and out-of-Park actions described above will be sufficient.</li> <li>♦ Detection – Personnel to carry out normally assigned duties.</li> <li>♦ Get Away Standard – 10 Minutes</li> <li>♦ Preparedness - Two engines will be prepared for operation. Fire suppression tools will be added to Park vehicles involved in field operations.</li> </ul>
III (High)	21 - 42	<p><i>All Staffing Class-1 and 2 actions apply with further considerations noted below</i></p> <ul style="list-style-type: none"> <li>♦ Prevention - Restrictions will be implemented against any smoking in the Park's backcountry. Out-of-Park activities may include notification to local media services of increasing fire danger.</li> <li>♦ Detection – Personnel to carry out normally assigned field duties with special emphasis on fire detection. At the discretion of the Chief of Resource Protection, one or more individuals may be assigned road patrol at set times during the day.</li> <li>♦ Get Away Standard – 5 Minutes</li> <li>♦ Preparedness - Fire suppression tools will be added to designated Park vehicles. A minimum of two engines will be operable. The Fire Management Officer has the authority to increase the Staffing Class by one level if warranted by current and/or forecasted burning conditions.</li> </ul>
IV (Very High)	43 – 51	<p><i>All Staffing Classes-1, 2, and 3 actions apply with further consideration noted below.</i></p> <ul style="list-style-type: none"> <li>♦ Prevention - Out-of-Park activities will be stepped-up to include notification of local and regional media services. Coordination with other agencies will increase in terms of both short and long range planning, public notification, coordinated prevention activities, and increased cooperation.</li> <li>♦ Detection – Park personnel will carry on normally assigned detection duties. FMO or Chief of Resource Protection may designate one or more personnel to part or fulltime road patrol. Patrols may be increased at the discretion of the FMO or Chief of Resource Protection.</li> <li>♦ Get Away Standard – 5 Minutes</li> <li>♦ Preparedness – Preparedness overtime may be authorized by NGPA FMO, Fire Program Manager, or Fire Program Coordinator if necessary to conduct these activities. An initial attack crew of at least 2 personnel, will be identified and available to staff an engine. An ICT IV will be available. All available engines and the water tender will be made fire-suppression ready. All Park personnel qualified and assigned fire suppression duties will be notified about the fire danger. Dispatch may be staffed for extended hours. Automatic dispatch of the interagency helicopter to fires, if the helicopter is on contract, will be implemented. Notice will be forwarded to the cooperator offices of the very high fire danger condition. Daily availability of additional local and regional resources will be monitored. Temporary closures may be imposed upon areas in the park or for certain activities in conjunction with similar impositions by adjacent land managing agencies.</li> </ul>

*Table continued on next page*



Staffing class	Burning Index	Actions
V (Extreme)	52 +	<p><i>All Staffing Classes-1,2,3,4 actions apply with further consideration noted below .</i></p> <ul style="list-style-type: none"> <li>◆ Prevention - Visitors to the Park will be verbally warned of the fire danger, all smoking on trails and in moving vehicles will be expressly prohibited, and no open fires or stove fires will be permitted anywhere in the Park. Cooperators will be advised in regard to conditions and opportunities for bans on open burning.</li> <li>◆ Detection - Fire patrols will be increased.</li> <li>◆ Get Away Standard – 2 Minutes</li> <li>◆ Preparedness –Consideration will be given to prepositioning additional local or regional suppression resources in the park to supplement suppression capabilities.</li> </ul>

### • **Wildland Fire Detection**

Badlands National Park relies on ground-based fire detection using confirmation of visitor reports with park personnel. When in Staffing Class IV or V during the approach and passage of thunderstorms, lookouts will be pre-positioned at strategic locations to watch for lightning strikes and smoke. Personal knowledge of the area is required for this duty, as these locations vary depending on the direction of any storm. Experience indicates that a minimum of three lookouts are required for "cloud watch," one for each district.

All smoke and fire reports will be made to the park's communication center. If a dispatcher cannot be reached, then a report will be made to the park fire office. The park fire office will notify the NGPA Fire Management Office of all fire or smoke reports as soon as possible. To enhance communication with cooperators and the public, the fire office may notify cooperators, fire management offices, and the local radio station.

Visitors and employees will report most fires. Any park employee to whom a fire is reported shall obtain complete information regarding the following: location; fire behavior and smoke dispersal; approximate size; and name, address, and phone number of reporting party. These personnel are instructed to take fire reports from visitors and relay the pertinent information to the park dispatch office or Fire Management Office. If possible, they should remain in contact until the fire is confirmed and located. Further investigation may be necessary if park staff in the field cannot verify a reported fire. Park Rangers on road patrol and backcountry rangers and crews will look for new fire starts as part of their routine duties.

### • **Appropriate Management Response**

Consideration of human safety, availability of equipment, management objectives, and constraints will govern all wildland fire response. Current Badlands National Park objectives include aggressive initial attack and/or appropriate management response by NPS personnel of all fires occurring within the park. In general, these can be met most effectively and cost-efficiently by:

1. Quickly evaluating each fire occurrence within the park for geographic location, spread potential, and amount and type of force(s) needed for effective suppression.
2. Providing rapid, aggressive initial attack for those fires to be suppressed.
3. Using appropriate management response methods and tactics designed to efficiently and effectively suppress fires while accomplishing resource management objectives so



that park personnel can return to their normal duties as soon as possible.

Whenever fire is reported within park boundaries, the following steps will be taken:

1. Report of the fire to the Badlands National Park dispatch office or Fire Management Office. The park does not have a full-time dispatcher. The Fire Program Manager or Fire Program Coordinator will begin dispatch duties and radio operation.
2. Determine the location, legal description, and land ownership at the occurrence site.
3. At least two or more Badlands National Park personnel will be dispatched to the location of the fire. Personnel dispatched will be qualified and equipped to undertake initial attack action.
4. Division Chiefs will be notified of the need to put their available personnel on standby (during normal duty hours). All personnel placed on standby will assemble at the appropriate staging area.
5. Immediately upon arrival at the fire location, a Stage I Wildland Fire Implementation Plan (WFIP) will be completed. Information found in the Stage I WFIP includes a report of the fire size, behavior, environmental conditions, fuels, terrain features, existence of special hazards or threats to persons or improvements, and any other factors observed which could affect fire behavior and suppression efforts. This information will be reported to the Badlands National Park Chief of Resource Protection. These fire size-up observations will be immediately forwarded to the Northern Great Plains Fire Management Office (NGPAFMO).
6. Upon determination of actual fire location and based on the information reported following the initial fire size-up, the Northern Great Plains FMO, Chief of Resource Protection, or his/her designee will develop the appropriate suppression response, giving consideration to applicable resource management objectives and constraints, together with considerations of personnel safety and economics. Data gathered in the size-up will be utilized to determine an appropriate strategy for managing the fire.

The Northern Great Plains Fire Management Office will monitor the Burning Index (BI) daily from each of the three park weather stations. Whenever a fire is reported on Badlands National park-administered lands, forces and equipment dispatched for initial attack will be based on daily Burning Index from the nearest park weather station, fire location, existing and predicted environmental conditions and any other factors pertinent to making sound fire management decisions.

All unwanted wildland fire will receive an immediate and aggressive initial attack response. The first qualified Incident Commander on-scene will determine the appropriate suppression strategy to be utilized. The Chief of Resource Protection or his/her designee will keep the Superintendent updated of the fire situation. The goal in initial attack actions is to limit damage to threatened values, while minimizing the area burned and preventing escape of the fire. An Incident Commander Type IV (ICT4) will be responsible for all actions taken on the fire. The ICT4 will inform the Area Fire Management Officer of the fire situation as soon as possible after arrival on the scene. If the fire behavior and complexity continue to increase, the ICT4 may be replaced by an ICT3 along with additional support personnel and equipment. The Area Fire Management Officer, Chief of Resource Management, or their designee is responsible for the selection of a replacement Incident Commander.

If the fire threatens to exceed all initial attack capabilities, the fire will become an extended attack action. Extended attack actions occur when fires have not been contained or controlled





by initial attack forces. Extended attack continues until either the transition to a higher level incident management team is completed or the fire has been contained or controlled. The Wildland Fire Situation Analysis (WFSA) must be completed by park staff when a fire escapes initial attack, and if the action escalates to incident management team levels, the incoming team will be briefed by the Superintendent (Agency Administrator's Briefing) and current Incident Commander. The team will be given a written delegation of authority and will have an Agency Administrator's Representative assigned as a staff member to the incoming Incident Commander. The delegation of authority will provide the Agency Administrator's priorities, constraints, and other guidelines prerequisite to effective suppression of the fire.

When the team has accomplished its assigned tasks, the fire will be transferred back to the park. A local Incident Commander will be assigned, and the departing team will hold a debriefing to provide for an orderly transition of command. The Superintendent will conduct a closeout session that will include a performance evaluation of the departing team. The transition Incident Commander will assume command at the agreed upon time. The departing team will then be demobilized.

Occasions in which two or more fires are ignited can be generally associated with days when high to extreme fire intensity condition exists. Suppression actions taken on multiple fires can quickly deplete Badlands National Park's fire suppression resources. At least two individuals will be dispatched to each fire reported on days experiencing multiple starts. However, if sufficient personnel are not immediately available, the priority order will govern which fires in which units will receive the first available personnel resources. Priority of initial attack on days of multiple fire starts will be:

1. Fires threatening life or property within park boundaries;
2. Fires starting within the park which are within one mile of park boundaries and which are likely to burn across the boundary and onto non-park lands;
3. Fires starting outside the park which are within one mile of park boundaries and which are on lands administered by the USDA Forest Service, Buffalo Gap National Grassland or on the Pine Ridge Indian Reservation. Initial attack on fires starting on such lands is allowed pending approval of a Cooperative Fire Control Protection Agreement executed by and between the U.S. Forest Service, Bureau of Indian Affairs, and the National Park Service;
4. All other park lands.

Safety in fighting fire is extremely important. Firefighting is hazardous work, sometimes performed in unfamiliar surroundings and under emergency conditions. Special hazards are almost always present and danger from fatigue conditions can give only subtle warnings. It is the responsibility of every incident commander to ensure that safety instructions are given and followed during all suppression actions. It is the responsibility of every employee to perform only jobs that they are qualified for, to wear personal protective equipment at all times, and to ensure that adequate water, food, and rest are provided to firefighters so that high standards of safety can be maintained. Ultimately, each firefighter is responsible for his/her own safety.

- **Wildland Fire Monitoring**

Wildland fires will be monitored at levels 1 and 2 with observations entered into the park's monitoring database. In the event that long-term fire effects plots are burned in a wildland fire they will then be read, by the NGPA Fire Effects crew, according to the schedule of plot rereads following a burn treatment. Level 1 and 2 monitoring observations will be filed with the final fire



package and a copy placed with the records for the Fire Management Unit that was burned.

- **Wildland Fire Documentation, Reports, and Records**

**Individual Fire Reports (DI-1202)** - Procedures are outlined in *RM-18*. Fire reports will be completed by the Incident Commander, submitted to the Fire Program Coordinator, and then forwarded to the NGPA Fire Management Office for approval and input to the National Park Service Shared Applications Computer System (SACS). Individual fire reports will be completed for Badlands National Park wildland fires, cooperative agreement fires, and all other fire responses, including all out-of-park fire assignments. Each wildland fire suppression documentation package will include the following:

- Individual Fire Report Form (DI-1202)
- Fire Weather Observations
- Situation Reports and fire updates
- Incident Maps
- Wildland Fire Situation Analysis (if appropriate)
- Narrative Summary (if appropriate)

Also, all fires of suspicious or unknown origin will be investigated by a Wildland Fire Investigator to determine the cause. Legal action, if appropriate, will be pursued. In such cases, a fire investigation report will be included in the fire documentation.

**Table 3** below shows the reports and records necessary for implementation of the park's fire management program:

**Table 3: Reports and Records Required to Implement the Badlands Fire Program**

RECORD/REPORT	FREQUENCY	RESPONSIBLE PARTY	DISTRIBUTION
DI-1202 Fire Report	Per Incident, w/I 5 days	IC	FPC, FMO
DI-1202 Computer Entry	Within 10 days	FMO	SACS
Fire Weather Records	Daily	FMO	Park
Fire Atlas	As Needed	FPM	Park
FMP revision and EA	5 years	FPM, FMO	Park, FMO, MWRO
Situation Report	As Needed	FMO	Park, FMO, MWRO
Fire Danger/Staffing Class	Daily During Fire Season	FMO	FPM, FPC, Park
Wildland Fire Situation Analysis (WFSA)	Per Extended Attack Fire	IC, Supt	FMO, Supt, FPC
Rx Fire Plan	Per Rx Fire	Rx Fire Burn Boss, FMO	Supt, FMO, MWRO
Red Cards	Annual	FMO	FPC, Park
Hazard Fuel/RM Project Accomplishment Reports	Per Project	FMO	Park, SACS

*Table continued on next page*



RECORD/REPORT	FREQUENCY	RESPONSIBLE PARTY	DISTRIBUTION
FIREPRO funding requests for Rx Fires	Annual	FMO	FMO, MWRO
Supplemental FIREPRO Budget Requests	Annual	FPM, FMO	FPM, FMO, MWRO
Fire Reviews	As Needed	FMO	Park, FMO, MWRO
Fire Critique	As Needed	FMO, FMT	Park

**Abbreviations:** FMO = Northern Great Plains Area Fire Management Office  
 MWRO = Midwest Regional Office  
 Supt = Badlands Park Superintendent  
 FPM = Badlands Fire Program Manager (currently Chief, Resource Management)  
 FMT = Badlands Interdivisional Fire Management Team  
 FPC = Badlands Fire Program Coordinator  
 IC = Incident Commander  
 SACS = Shared Access Computer System (interagency fire database)  
 FIREPRO = Federal fire program

### **Wildland Fire Use**

Only naturally ignited wildland fires can be managed to accomplish resource management objectives once an appropriate management response is chosen based upon the Wildland Fire Implementation Plan Stage I: Initial Fire Assessment. All human-caused wildland fires will receive a suppression response commensurate with values-to-be-protected, firefighter and public safety, and cost efficiency. Human-caused wildland fires will also include an investigation phase for possible legal recourse.

- ***Rational for Wildland Fire to Accomplish Resource Objectives***

Badlands National Park has identified a Natural Management Unit, which allows wildland fire use, which will be managed and maintained to retain its primitive character, allowing natural processes to occur. Although moderate in size it represents 22% of the total park acreage (53,406 acres) and based upon geography and geology represents an opportunity to permit fire to play its role in these fire dependent communities. The area also provides opportunities for public understanding of fire ecology in the area along the Badlands Loop Road and Sage Creek Road, both of which provide access for visitors to the area. Strategies to provide for firefighter and public safety and protect property will be proactive.

- ***Wildland Fire Use Objective***

The primary objective for wildland fire use will be to permit wildland fire use in the fire-dependent communities to maintain the natural variability of the ecosystem. Wildland fire use combined with prescribed fire will not exceed 10,000 acres per year parkwide.

- ***General Plan of Implementing Wildland Fire Use***

A workshop will be conducted prior to the start of fire season to review the fire management plan and Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide and go through a mock fire use scenario to refresh staff roles and



responsibilities. Every other year the regional prescribed fire specialist or fire management officer will be involved in this workshop to critique and assure compliance with policy.

- **Decision Responsibilities**

It is the responsibility of the Fire Program Manager or their designee to prepare the Decision Criteria Checklist to present the checklist to the Park Superintendent for evaluation and signature. The Decision Criteria Checklist will include an evaluation of visitor use in the park at the time of the fire start.

- **Personnel Qualifications**

An Incident Commander of the appropriate complexity rating must be assigned to all wildland fire use actions and remain in the immediate area for the duration of the fire. A Long Term Fire Analyst or Fire Behavior Analyst will be resource ordered to arrive within 24 hours of the decision to "GO" with an appropriate management response. Should a prescribed fire behavior analyst not be available within 36 hours actions will be taken to suppress the fire. When a wildland fire is designated to be managed under a wildland fire use strategy, a Resource Advisor will be assigned to that incident.

- **Monitoring Required**

Level 2 Fire Monitoring as described in the *Fire Monitoring Handbook* (2001) will be completed daily on the fire. During periods of forecast growth greater than 100 acres per day, on-site observations of dry bulb, relative humidity, wind speed, wind direction and cloud cover will be made one hour before activity begins to two hours after activity ceases or minimally from one hour before sunrise to two hours after sunset. Fire characteristics as described in the *Fire Monitoring Handbook* will be collected on site hourly when conditions and monitor safety permit. Smoke characteristics will be monitored hourly any time a forecast wind direction places the smoke plume towards a community and/or highway.

- **Fire Use Planning**

Wildland fire use implementation will not be considered when the park is in or forecasted to be in staffing class V (Extreme) at the time of the ignition. **Fig. 4** (pg. 22) identifies Prescribed Fire Units within the Natural Unit. These boundaries should be utilized to assist in rapid development of a final Maximum Manageable Area (MMA) for Stage II implementation of a wildland fire use strategy. The fast-moving nature of grass fires prohibit lengthily planning exercises after ignition to develop an MMA. Trigger points for various management holding actions may be developed, after the MMA is finalized. PFUs may be combined or altered, bearing in mind the 10,000 total acreage burned limitation within the Sage Creek Unit of the Badlands Wilderness Area. These PFUs vary in size from the smallest, Sheep Table Mountain (FMA J) at 1387 burnable acres, to 5147 burnable acres (FMA F). If natural ignitions do not occur within the Natural Unit, and it is determined that the fire frequency therein is significantly outside of the historic range of variability, then the FMA boundaries may be utilized as prescribed fire boundaries to simulate natural ignitions. FMAs are only developed for larger, contiguous areas of wildland fuel within the Natural Unit. Any ignition occurring in an isolated pocket of wildland fuel bounded by badlands may be managed for resource benefit using a wildland fire use strategy. Portions of the Boundary FMU may be combined with the Natural FMU in developing the Maximum Manageable Area (MMA) for a fire with the focus then being on the maximum permissible acres allowable because of wildlife forage.

- **Fire Use Implementation Procedures**

All wildland fire use applications will follow the Wildland and Prescribed Fire Management Policy



Implementation Procedures Reference Guide (1998). A Wildland Fire Implementation Plan (WFIP) Stage I will be completed on every wildland fire, including a GO/NO GO decision to manage the fire as a wildland fire use incident. A Stage II WFIP: Short Term Implementation Actions will be completed within 2 hours of the "GO" decision from Stage I. The Stage II WFIP will include the delineation of a maximum manageable area (MMA). The need assessment chart for Stage III will always be completed with the Stage II activity. Finally, if the event is expected to have a long duration, a Stage III WFIP: Long Term Implementation Actions will be completed.

- **Documentation and Project Records**

Each wildland fire use documentation package will include the following:

- Individual Fire Report Form (DI-1202)
- Fire Weather Forecasts for every day
- Monitoring reports including summary of findings, monitoring schedule, and field observations
- WIMS forecasts (NFDRS indices and components)
- Situation Reports and fire updates
- Incident Maps
- Wildland Fire Implementation Plan including revalidation and certification documents, Stages I, II and III as appropriate to complexity and duration. This document will also identify resource objectives being met through wildland fire use.
- Wildland Fire Situation Analysis (if appropriate)
- Narrative Summary
- Photographs and videos will be held in the park fire management files for one year and then stored with the park archives and library collection.

- **Information and Interpretation Actions**

The park's wildland fire use program will include an information and interpretation program, which provides for the timely and accurate communication of:

- The specific fire management objectives of NPS and the park.
- Information on fire location, behavior, growth.
- Information on the effects of fire.
- Fire management actions taken on a fire.
- Fire impacts, on and off the park, on public and private facilities and services.
- Restrictions and closures within the park.

During wildland fire use activities, as with prescribed fires, the park will emphasize the positive elements of fire's past and present role in the park ecosystem through an aggressive interpretive program. Adequate and accurate public information on the goals and program rationale for fire management at Badlands National Park is critical to program success. The local communities of Interior, Scenic, Wall, Kadoka, Philip, and the Pine Ridge Indian Reservation may be affected by the park's programs to some degree depending on the size of the project. Smoke generated from wildland fire is of special concern, since public health and safety are affected. One vehicle for dissemination of information is through park interpretive media. Public education programs on fire management themes are most effective when the smoke is present. Interpretive tours and on-site talks during wildland fire will be planned on a case by case basis. Signs will be designed and built that will convey short informative



messages to the public on park trails and roads.

The three actions described in **Chapter X** (Public Information and Education) of this plan will provide management guidance for this program. In addition, message-specific signs that describe a wildland fire in progress will be posted at appropriate trailheads and along trail(s) through or near the fire.

- **Potential Impacts with Mitigation**

Paleontological impacts should be low, as most sites containing significant fossil resources are located in unvegetated rock outcrops. If any fossil resources are discovered during fire management activities, ground disturbance and travel will be rerouted around the area. The exact location of the paleontological site will be reported to the Park Paleontologist and a follow-up determination will be made as to the significance of the resource. Any significant paleontological site should be protected from wildland fire as deemed necessary by the investigating paleontologist and recorded in the park's files. The greatest potential for impact to exposed fossils is from vehicle travel.

Vegetation could have some long and short-term impacts associated with spread of non-native species into fire disturbed sites. Resource Management will monitor each burn site one year post-burn to map infestation levels and treat as appropriate with Integrated Pest Management (IPM) techniques for control. Project funds may be used for the post-burn survey.

Park wildlife staff will be consulted prior to any planned fire management activities. Disturbances such as temporary displacement, loss of habit, or interference with reproductive activities (e.g. bighorn sheep lambing, nesting) will be considered in all aspects of fire management planning. Any fire management activities planned in park areas known to support species listed as threatened or endangered (*Appendix C*) may require further consultation with the US Fish & Wildlife Service, and mitigation. Details of wildlife mitigation measures will be detailed in fire management project plans. Wildlife are not expected to experience adverse impacts if these prescriptive elements are followed.

Aquatic species may experience an immediate post-burn short-term impact from increased soil erosion runoff, possible water temperature increases, and removal of riparian vegetation. No actions are required, as natural vegetation processes will replace the disturbed communities.

Air Quality/Smoke Management will have immediate short-term impacts, typically of an episodic nature, which will require mitigation when critical sites are impacted. This mitigation will include limiting fire acreage growth when winds are forecast such that the smoke plume will impact nearby communities. When smoke is forecast or observed to be impacting Interstate 90 or Highway 44 the South Dakota Highway Patrol and Department of Transportation will be notified to restrict traffic speeds commensurate with visibility and associated driving conditions.

Visual and Noise Quality will experience immediate short-term impacts associated with wildland fire management activities and some long-term impacts resulting from drastic changes in the visual appearance of the affected area. The long-term impacts are related to the viewer's perception and must be addressed in media and visitor contacts to promote the understanding of fire's role in the ecosystem.

Archeological resources, historical sites and structures may experience long and short-term impacts with the worst case scenario of previously unrecorded resources being consumed or altered by the fire. Mitigation will be through coordination with the Midwest Archeological Center (MWAC), South Dakota State Historic Preservation Officer (SHPO), and protection of known sites. Any sites discovered during wildland fire management activities will have ground disturbance and travel rerouted around the area, its exact location will be reported to the Chief



of Resource Education and a follow-up determination will be made by a representative of MWAC as to the significance of the resource.

Economic impact will be short-term associated with visitors wanting to leave the fire area because of perceived or real threat to health and safety. This can be mitigated through public awareness, information dissemination, and cooperation with the local communities for a complete understanding of the management actions that are being taken on each wildland fire. Additionally, when wildland fire use or a prescribed fire is in progress, an interpretive sign or personnel will be stationed in a high-volume visitor use area (e.g. parking area, trailhead) to discuss the benefits of fire.

Visitors will experience immediate short-term impacts from possible temporary trail closures, perceived scenic degradation by blackened prairie, travel restrictions, and visibility impairments. Mitigation is to minimize the impacts but retain the focus of public safety. This is also the opportunity to deal with visitor concerns by increasing the number of visitor contacts through additional staffing and coordination with all cooperators to assure the information is reaching the impacted groups.

Concession Operations may experience a short-term impact from a temporary closure, travel restriction, and/or visibility impairment. Mitigation will be by information sharing and public contacts with affected user groups as to the duration and magnitude of the impact.

### **Prescribed Fire Program**

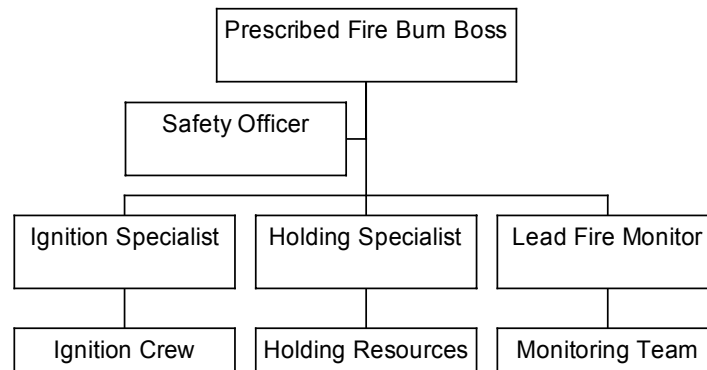
Prescribed fires are utilized as a tool to achieve management objectives. Prescribed fire will reflect and support resource management objectives to restore some vegetative conditions, maintain others, and simulate natural fire where ignitions have not occurred or management action was required. Treatment of landscape-scale areas, with prescribed burning, strives to restore fuel loading and vegetative composition to the natural conditions existing prior to the fire exclusion policy and practices followed in the park through recent years. Research burning may also take place when it is determined necessary to support research projects under permit with the NPS.

Prescribed fire, like wildland fire use, is authorized in the Badlands Wilderness Area. These fires may be used where it has been determined by resource management and fire management personnel that prescribed fires are a necessary substitute for naturally occurring fires.

Actions included in the prescribed fire program include: selection and prioritization of projects to be carried out during the year, Prescribed Fire Plans, prescription preparation, documentation and reporting, and burn critiques. Measures to ensure successful implementation of prescribed fires will include Prescribed Fire Plans prepared by a qualified Prescribed Fire Manager (RXM1 or RXM2) or a Prescribed Fire Burn Boss (RXB1 or RXB2). A qualified Prescribed Fire Burn Boss will conduct prescribed fires with qualified support personnel present to accomplish objectives. Support personnel will monitor fire behavior and fire effects, control hot spots and fires outside control lines, support ignition needs, and complete initial attack on escaped fires. The complexity of Badlands National Park prescribed fires requires a normal organization structure (**Fig. 5 on next page**) consisting of Type II Burn Boss (RXB2), Type II Ignition Specialist (IGN2), Holding Specialist (specific mnemonic depends on number and type of holding resources), and Prescribed Fire Monitor (FEMO). This organizational structure may be modified for specific requirements.



**Fig. 5: Typical Prescribed Fire Organization**



The park will continue with a training program designed to maintain a minimum of two personnel qualified in each of the prescribed fire overhead positions. This program ensures continuity during the normal turnover of permanent staff.

All Prescribed Fire Plans will be approved and signed by the Park Superintendent. Outside support in the form of NPS prescribed fire management teams or interagency incident management teams may be requested for support in planning, implementation, or supplemental management stages.

- **Annual Prescribed Fire Planning**

Prescribed burning may be used throughout Badlands National Park to accomplish resource management objectives as outlined in this plan. The Northern Great Plains Prescribed Fire Specialist will prepare the annual Prescribed Fire Plan with assistance from the Northern Great Plain Area FMO at Wind Cave National Park, the Midwest Regional FMO in Omaha, Nebraska, the Badlands National Park Fire Coordinator, and the Badlands National Park Resource Management Specialist. The program will detail all burn projects proposed, including Prescribed Fire Plans, for the coming year and will specify objectives of each burn. The program plan will be reviewed by the Chief of Resource Protection and Chief of Resource Management. The plan will then be submitted to the Superintendent for approval.

The Area Fire Management Officer will recommend a Prescribed Fire Burn Boss for each specific planned burn. The Burn Boss will conduct a field reconnaissance of proposed burn locations with park staff to discuss objectives and special concerns and to gather all necessary information to develop the Prescribed Fire Plan.

The ten-year burn schedule is included in *Appendix H*. Additional prescribed fire projects may be added to either a) conduct specific exotic species control, particularly adjacent to roadsides, and b) to simulate natural processes within the designated wildland fire use area, should none occur naturally.

- **Prescribed Fire Plan**

The Prescribed Fire Plan is a site specific action plan which describes the purpose, objectives, prescription, operational procedures, go-no go check list, organization chart, weather forecasts, contingency actions, monitoring actions, and safety concerns involved in burn preparation and implementation. The treatment area, objectives, constraints, and alternatives will be clearly outlined, and no burn will be ignited unless all prescriptions of the plan are met. The factors considered in all Prescribed Fire Plans are described in *RM-18*. Prescribed Fire Plans will be approved by a qualified burn boss, with technical assistance provided by the Black Hills Area





Parks Fire Management Office. All plans will be reviewed by the Area FMO and approved by the park's Superintendent.

- ***Prescribed Fire Operations***

Prescribed burns shall be conducted under the direction and control of a Prescribed Fire Burn Boss designated by the Northern Great Plains Area FMO. The project Burn Boss will be certified for that position according to standards currently utilized by the National Wildfire Coordination Group. All positions required to conduct the burn will be filled with qualified personnel. All personnel listed in the plan must be available for the duration of the burn or it will be postponed.

Operational guidelines, allowable ranges of fire behavior and allowable ranges in weather conditions shall be specified in the Prescribed Fire Plan drafted for each prescribed burn project. Each prescribed burn project shall include monitoring and evaluation as part of the project. This monitoring and evaluation must be a continuous activity during the actual burn operation. Its purpose is to ensure that the ongoing fire behavior and weather conditions remain within the Prescribed Fire Plan parameters. The individual responsible for the ongoing fire monitoring/evaluation shall keep the project Burn Boss informed of any and all changes, which might result in the fire exceeding the Prescribed Fire Plan parameters.

Weather, fuel loading, and fuel moisture conditions must be monitored closely in planned burn units to determine when the prescription criteria are met. Weather data will be gathered for a period of 30 days prior to burn implementation to enable calculations of fuel moistures, energy release component, ignition component, and burning index. Fuel moisture samples of dead fine fuels, fine dead woody fuels (if appropriate), or live fuels may be collected, weighed, oven dried, and percent moisture contents calculated to assist in determining when conditions are consistent with the prepared prescription.

When all prescription criteria are within the desired ranges, the Prescribed Fire Burn Boss will select an ignition date/dates based on current and predicted weather forecasts and available resources. The Resource Management Specialist will identify the windows of opportunity and work with the Prescribed Fire Burn Boss to assure the burn is accomplished the year it is scheduled. All personnel and equipment will be assembled on the day prior to the planned ignition date. A thorough briefing will be conducted stressing personnel assignments, resource placements, contingency actions, and safety concerns and measures to mitigate these concerns. Ignition sequence will be of special concern. Ignition team members must know how and where to ignite, as well as the locations of sensitive areas to be excluded from treatment. A current spot weather forecast will be obtained on the day of ignition, and all prescription elements will be rechecked to determine if all parameters are within the desired ranges. If all prescription criteria meet the planned ranges, a test fire will be ignited to determine on-site fire behavior conditions. If these conditions appear satisfactory and consistent with the plan, the burn will continue. If the test burn indicates the fire behavior to be outside the desired ranges, the test fire will be suppressed and the main burn will be postponed until conditions are more favorable.

The Prescribed Fire Burn Boss will, at a minimum, be a qualified Incident Commander Type IV (ICT4). An Incident Commander Type III will be available within a one-hour response time of the project. In the event a prescribed fire escapes the assigned holding resources, ignition of the prescribed fire in progress will cease. The on-scene ICT3 or ICT4 will then assume control of the escaped fire and take appropriate suppression actions as discussed in the pre-burn briefing, while the Prescribed Fire Burn Boss continues management of the prescribed fire. The Chief of Resource Protection and NGP Fire Management Office will be notified immediately of



the current escape and prescribed fire status. Once a wildland fire declaration has been made, the project cannot return to a prescribed fire designation. For all escaped prescribed fires converted to wildland fire status, a Wildland Fire Situation Analysis will be prepared and appropriate resource orders will be placed.

- ***Prescribed Fire Monitoring***

Prescribed fire can be successfully used to reintroduce fire as an ecosystem process and to alter plant communities toward more desirable compositions. Prescribed burning will be used at Badlands National Park to meet the resource management objectives listed in **Chapter II** of this fire management plan. Monitoring is used to establish quantifiable objectives and then observe and measure the key indicators to evaluate whether these objectives were met. For example, the park is going to restore fuel loads and plant community structure and composition. To determine if a prescribed fire has accomplished these objectives, the changes in fuel loadings and the relative abundance of species must be measured.

Fire monitoring is called for in the 1999 Resource Management Plan. Fire effects monitoring will be identified in future project statements. The park will use the protocols in the National Park Service *Fire Monitoring Handbook* (2001) to examine short and long term fire effects. The Northern Great Plains Fire Monitoring Team based at Wind Cave National Park will be installing, monitoring and rereading monitoring plots for the park. Monitoring type descriptions will be written in cooperation with the Resource Management Specialist and included as part of the Fire Monitoring Plan included as *Appendix F*. Plot installations will be based on burn priorities and will reach a statistically valid sample size within five years for the priority monitoring types. For further information regarding prescribed fire monitoring, please see the Monitoring Plan in *Appendix F*.

An important part of monitoring involves comparing burned areas to non-burned areas. Consequently, control plots of sufficient size and acreage to proposed park prescribed fires may be established at a future date. These control plots will represent similar areas of species composition and diversity as areas to be treated and will be maintained free of prescribed or natural fires, as much as possible. Resource Management staff will assist members of the Northern Great Plains Fire Monitoring Team in monitoring established FMH plots. Team members will, in turn, assist Resource Management staff in monitoring these control plots.

- ***Prescribed Fire Documentation and Reporting***

All prescribed burn documentation will be completed by the Prescribed Fire Burn Boss, the NGPA Prescribed Fire Specialist, or FMO. Fire monitors will collect all predetermined information and complete all necessary forms prior to, during, and after the burn. All records will be archived in the park's fire records and stored in the Fire Management or Resource Management Office for future use and reference.

The Prescribed Fire Burn Boss will prepare a final report on the prescribed fire for Superintendent. Information will include a narrative of the burn operation, a determination of whether or not the objectives were accomplished, weather and fire behavior data, a map of the burn area, photographs of the burn, number of hours worked, and final cost of the project.

Each prescribed fire documentation package will include the following:

- Documentation of all management decisions concerning the project
- Prescribed Fire Plan
- On-site Weather Observations
- Project Maps



- Open Burning Permits
- Spot Weather Forecasts
- Narrative Summary Analyzing Costs, Objectives, and Chronology of Events
- Individual Fire Report Form (DI-1202)

- ***Prescribed Fire Critique***

The Superintendent may convene a review committee for any prescribed fire. A report detailing the actual burn will accompany any recommendations or changes to the program identified. The report will be submitted to the Superintendent, the Area Fire Management Officer, and the Regional Fire Management Officer for review.

- ***Air Quality and Smoke Management***

National Park Service fire management activities which result in the discharge of air pollutants, (e.g., smoke, carbon monoxide, and other pollutants from fires) are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements. These requirements are specified by Section 118 of the Clean Air Act, as amended (42 U.S.C. §7418).

It is not the primary intent of the Clean Air Act to manage the impacts from natural sources of impairment (i.e. naturally ignited wildland fires). Smoke from these fires is an inevitable by-product. Fires are not considered point sources of emissions, but tend to be spatially distributed singular events, and temporary impacts to visibility and visitor enjoyment must be recognized, expected, and managed. This may include temporary closures or warnings during the progress of management approved prescribed fires.

Smoke drift affecting neighbors and public roads is a concern. Pertinent areas that will demand attention include the Interstate Highway travel corridor north of the park, the Badlands Loop Road, and the towns of Interior, Scenic, Wall, Philip, Wanblee, Kadoka, and Rapid City, South Dakota, as well as other towns and communities on the Pine Ridge Indian Reservation south of the park.

Badlands National Park is designated a Class I area under the Clean Air Act due to the presence of the Badlands Wilderness Area. This designation places an affirmative responsibility on the Park Superintendent to maintain or improve air quality.

Ambient air quality and meteorological monitoring are conducted at the park, including gaseous pollutants (sulfur dioxide, and ozone). DI-1202 reports will be made available as needed to the park's air quality technician or contractors in order to reconcile unusual readings related to fire activity. Meteorological parameters monitored include wind speed and direction, temperature, relative humidity, solar radiation, and precipitation.

Badlands National Park will comply with Air Quality-Smoke Management Guidelines listed in *RM-18*. The fire management program will be in compliance with interstate, state, and local air pollution control regulations, as required by the Clean Air Act. The procedures to ensure compliance will include:

- The Northern Great Plains Area Fire Management Office will contact local and state authorities to ascertain all procedures prerequisite to compliance with regulations or permits, will obtain any necessary permits or ensure in writing that regulatory requirements will be met. At this time, the State of South Dakota requires that the park inform the South Dakota Department of Environment and Natural Resources, Air Quality Program, prior to prescribed fires. Burning permits are not required. A copy of the Badlands National Park Fire Management Plan and Prescribed Fire Plans will be forwarded to the appropriate authorities, if necessary. Personnel from permitting agency



will be allowed on-site during prescribed fires and wildland fires used for resource objectives for observational purposes if necessary for their agency needs.

- Prescribed fires will be conducted only on days that are acceptable to the permitting agency. In the case of wildland fire use, local authorities will be contacted and kept informed of current status of fire(s). Any monitoring activities will be coordinated with the permitting agency and information collected will be made available to them as requested. The park will also notify local Federal Aviation Administration offices so that pilots may be made aware of possible temporary visibility impairments.
- All Prescribed Fire Plans will have clear objectives and will monitor impacts of smoke on the human and natural environments. Current and predicted weather forecasts will be utilized along with test fires to determine smoke dispersal. The fine-grass fuels in the park generate low volumes of smoke for short duration and are not usually a smoke management problem. An air dispersion analysis using the Simple Approach Smoke Estimation Model (SASEM), or a similar model, may be used to assess the impact to surrounding areas and detail the atmospheric conditions under which a burn can be successfully completed within the ambient standards.

Prescribed burns ignited in proximity to structures will be ignited only after careful considerations are given to levels of visitation and impacts upon visitation and local residents.

Considerations useful in managing smoke from longer duration fires include:

- Develop contingency plans to limit smoke production if the need arises (may involve suppression on portions of the line).
- Establish and maintain close communication with state and local air regulatory agencies regarding status of such fires.

## **NON-FIRE FUEL TREATMENT APPLICATIONS**

Non-fire fuel treatments to reduce fuels are generally not appropriate for Badlands National Park because the park is primarily comprised of grassland communities, particularly along the park boundary. Fuel treatments are not beneficial because of the short duration of effectiveness (i.e. the grass regrows too quickly and thatch will build up within two to three years. Also, the visual intrusion of mow lines and mower tracks in the native prairie is considered unacceptable to park management.

While not anticipated to be necessary at this time, limited mechanical treatments, including mowing or light thinning with chain saws may also be used as needed, so long as impacts to other park resources are adequately considered. These could be tools used to meet the objectives specified earlier in this plan.

## **EMERGENCY REHABILITATION AND RESTORATION**

Because of the rapid post-burn regrowth of the grassland communities in the park, emergency rehabilitation and restoration is not expected to be needed for any aspect of the fire program.



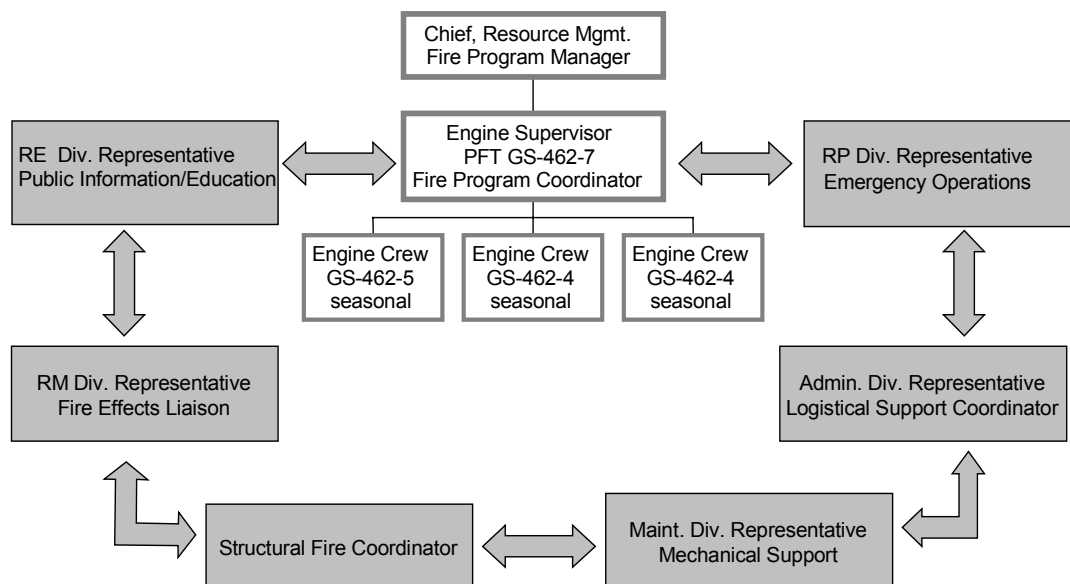
## VI. ORGANIZATIONAL AND BUDGETARY PARAMETERS

This chapter describes the key personnel for fire management at Badlands National Park, including the staff at the Northern Great Plains Area Fire Management Office (NGPAFMO). NGPAFMO is a FIREPRO-funded National Park Service program office that provides guidance, technical support and coordination for national park units in the Northern Great Plains. The sections below delineate the chain of command, describe responsibilities, and recommends targeted fire qualifications needed to ensure safe and efficient fire operations. It also describes interagency roles and responsibilities for coordination and cooperation.

### FIRE MANAGEMENT RESPONSIBILITIES: BADLANDS NATIONAL PARK

While direct oversight of the Fire Management Program at Badlands is the responsibility of the Chief of Resource Management, participation from all divisions is necessary to ensure all fire management activities are conducted safely and according to legal and policy constraints. The park utilizes a team approach to share responsibility and ensure input from across the park staff. Below is **Fig. 6**, the general organizational structure for the Badlands Fire Program:

#### Badlands National Park Fire Organization 2004



Gray boxes denote Interdivisional Fire Team for planning, coordination and support of all fire-related activities.

**Engine Supervisor/Fire Tech is Fire Team Leader.**

BCK3/03



Individual roles and responsibilities for the Badlands Fire Management Program are as follows:

***Park Superintendent:***

- Responsible for overall operation and management of the park, ensures that Department, Service and park policies are maintained and followed.
- Secures funds and personnel needed to meet the objectives of the park's Fire Management Program.
- Responsible for overall fire prevention within the park.
- Approves decisions to manage wildland fires as either wildland fire use for resource benefit, or as a suppression incident.
- Signs Go/No Go checklist for each prescribed fire.
- Signs verification forms for fuel management activities.
- Ensures that all park divisions support the team effort to maintain a fire management program.
- Approves Wilderness exemptions for fire management actions.
- Approves Fire Management Plan and all burn plans.
- Responsible for implementation of the Fire Management Plan.

***Fire Program Manager (Chief of Resource Management):***

- Provides oversight for the park Fire Management Program as part of the Resource Management Program.
- Directly supervises the park Fire Program Coordinator.
- In coordination with the NGPAFMO, ensures that the fire management program complements resource management objectives and complies with NPS and interagency fire policy.
- Coordinates the approval process for the Fire Management Plan including public scoping, internal and public review, and other National Environmental Protection Act (NEPA) compliance.
- Obtains input from technical experts for all fire planning.
- Ensures fire suppression activities are integrated with other emergency operations (law enforcement, search and rescue, structural fire protection) in the park.
- Coordinates, with NGP FMO to determine actions (fire use or suppression) for naturally caused fires in Natural Fire Management Unit.
- Ensures training opportunities for park fire personnel across all park divisions based on identified park needs and individuals' interest, and with supervisors' support.
- Provides general oversight for monitoring and research programs designed to evaluate fire effects on resources, and uses feedback from technical experts to incorporate adaptive management.
- Principle responsibility for planning and executing fire use projects, including prescribed fire and wildland fire use for resource benefit.
- Ensures technical staff for natural and cultural resources are trained to function in the Resource Advisor capacity.
- Ensures that appropriate fire management activities are incorporated into the park's GIS database.
- Ensures pre- and post-burn paleontological surveys are conducted in areas of potential impact from planned fire management activities.

***Fire Program Coordinator (FIREPRO):***

- Responsible for day-to-day fire program operations and implementation under direction from Fire Program Manager.
- Serves as Team Leader for the park Fire Management Team.



- Supervises seasonal FIREPRO funded engine crew.
- Ensures fire preparedness; maintains readiness for two type six engines throughout the year; notifies Maintenance of equipment and vehicle repair needs via work requests; maintains fire cache; manages FIREPRO budget; requisitions fire equipment; utilizes support funding to the benefit of the park.
- Organizes, coordinates and conducts fire training for park staff, including annual refreshers, in cooperation with NGPAFMO.
- Maintains individual park firefighter files; ensures all documentation is complete for each firefighter; ensures files are reconciled with SACS database.
- Administers pack tests, coordinates physical exams, submits documentation to NGPAFMO; ensures firefighters are issued red cards from NGPAFMO correctly and in a timely manner.
- Ensures all documentation for park fires (including DI-1202 reports) is completed and provided to NGPAFMO for input into the national database.
- Ensures GPS data collected for all fires and spatial data is input to the park's relational (GIS) database.
- Coordinates with the NGPAFMO and Badlands staff to plan and implement prescribed fires under the Fire Management Plan; assists NGPAFMO in writing prescribed fire plans.
- Qualified as an Incident Commander Type IV (ICT4) and Prescribed Burn Boss Type 2 (RXB2) within the National Wildfire Coordination Group (NWCG) fire qualification system.
- Coordinates park personnel dispatches for in- and out-of-park fire assignments with NGPAFMO and Northern Great Plains Interagency Dispatch Center.

***Fire Management Team:***

- This team consists of the Park Superintendent, The Chief of Resource Management (Fire Program Manager), the Fire Program Coordinator, and representatives from each division as identified by each division chief. The Park Superintendent may, at his/her discretion, designate other personnel to serve on the Fire Management Team.
- Meet at least once between fire seasons to review fire operations, identify problems/issues, and make recommendations for changes at the park or Northern Great Plains Area level as needed to improve the program; discuss upcoming FIREPRO budget for the park and make recommendations for use of support funds.
- Review the Fire Management Plan, particularly the prescribed fire schedule, making revisions as deemed necessary.
- May be convened by the Park Superintendent whenever fire and/or weather conditions present a serious threat to park facilities or resources, or neighboring property, to evaluate fire potential, weather and management concerns; determine an appropriate course of action, using the Fire Management and Resource Management Plans as guidelines and any prepared Wildland Fire Situation Analysis for ongoing fires.

***Fire Effects Liaison (Resource Management Specialist):***

- Primary park contact for the NGPA Fire Ecologist and Fire Monitoring Team.
- Responsible for ensuring ecological aspects of fire are incorporated into all aspects of the park Fire Management Program.
- Coordinates environmental compliance process for all fire-related activities.
- Lead author for NEPA-related documents pertaining to the Fire Management Program. Establishes interdisciplinary teams for completing environmental assessments of impact statements as needed.
- Serves as park liaison with the NGP fire monitors; coordinates monitoring and research



programs designed to evaluate fire effects on resources.

- Coordinates with NGPA Fire Ecologist to ensure fire effects monitoring is integrated with the NPS Northern Great Plains Inventory and Monitoring Program.
- Assists in development of five-year plan for prescribed fire activities.
- Develops information base on fire behavior and effects.

***Chief of Resource Protection:***

- Ensures traffic control and public use management is conducted when needed and requested by Incident Commander
- Ensures coordination between Wilderness Program and Fire Program.
- Provides a member of division, as well as the Structural Fire Coordinator, for participation on Fire Management Team.
- Supports and encourages fire training and assignments for Resource Protection staff, particularly higher-level skill positions.
- Supports the fire program by making personnel available for park fire operations, out-of-park fire assignments, and fire training to the extent possible.
- Assigns investigative resources to determine fire cause and pursue appropriate enforcement action when necessary for human-caused ignitions.

***Chief of Resource Education:***

- Incorporates fire management information into interpretive programs, when appropriate.
- Advises of cultural resource concerns; notifies State Historic Preservation Officer of planned fire activities for Section 106 compliance.
- Provides fire information to park staff and visitors.
- Ensures that accurate information is incorporated into park books, brochures, and exhibits.
- Provides for on-site interpretation of fires when appropriate and safe.
- May serve as Fire Information Officer, as appropriate.
- Supports the fire program by making personnel available for park fire operations, out-of-park fire assignments, and fire training to the extent possible.

***Administrative Manager:***

- Provides overall administrative support for the fire management program to include budget support, personnel services, contracting and purchasing.
- Provides a member of division for participation on Fire Management Team.
- Supports the fire program by making personnel available for park fire operations, out-of-park fire assignments, and fire training to the extent possible.

***Facility Manager:***

- Responsible for overall maintenance of fire cache building, equipment and vehicles, including wildland engines and water tender.
- Provides a member of division for participation on Fire Management Team.
- Supports the fire program by making personnel available for park fire operations, out-of-park fire assignments, and fire training to the extent possible.

***Resource Management Division Clerk:***

- Completes travel documents for fire personnel from all park divisions dispatched on assignment; maintains assignment log.
- Completes time recording for firefighters on park fires, and submits to appropriate timekeepers for payroll purposes.
- Serves a dispatch for in-park fire suppression activities.
- Assists Fire Coordinator in maintaining fire personnel files and all park fire records; tracks training and fire experience.





- Inputs data to SACS program assist NGPAFMO.

All qualified park personnel will be subject to occasional fire duty. The order of preference shall be dependent on availability/response time, level of qualification, and complexity of fire assignment. Division Chiefs are also responsible for making a reasonable effort to provide qualified firefighting personnel from their staffs to assist with wildland and prescribed fire support efforts, both locally and nationally.

## **FIRE MANAGEMENT RESPONSIBILITIES: NORTHERN GREAT PLAINS AREA FIRE MANAGEMENT OFFICE**

The Northern Great Plains Area Fire Management Office (located at Wind Cave National Park) was established to provide guidance and technical support for participating national park units (Wind Cave, Jewel Cave, Mount Rushmore, Devils Tower, Scotts Bluff, Agate Fossil Beds, and Badlands). The following are the key positions associated with this shared office and their responsibilities in the Badlands Fire Management Program.

### ***Fire Management Officer (FMO):***

- Responsible for overall safety of the Fire Management Program.
- Coordinates fire management activities within the Northern Great Plains Area (NGPA), providing technical assistance and advice to parks as needed. Reviews and advises the Superintendent on requests for fire emergency assistance, operational activities required for the implementation of this Fire Management Plan, and completeness and correctness of all final fire reports.
- In cooperation with the Superintendent, is responsible for assisting and coordinating the park's fire management program. This responsibility includes coordination and supervision of all prevention, pre-suppression, detection, wildland fire use, prescribed fire, suppression, monitoring, and post-fire activities involving park lands. Submits budget requests and monitors FIREPRO funds allocated to Badlands National Park.
- Nominates personnel to receive fire-related training as appropriate.
- Coordinates the implementation of the Fire Management Plan with other governmental agencies administering adjacent lands and with local landowners. Develops and implements cooperative fire management agreements with other federal, state, and local agencies and with the local landowners.
- Coordinates, prioritizes, and submits all FIREPRO funding requests for fire program activities. Reviews all burn plans and Fire Reports (DI-1202).
- Approves Red cards and Task books (certifies).

### ***Assistant Fire Management Officer (AFMO)/Prescribed Fire Specialist:***

- In cooperation with the park Fire Program Coordinator and Fire Program Manager, develops short and long-range plans for prescribed fires. Is responsible to coordinate Prescribed Fire Plans for individual projects.
- Responsible for coordinating development of Prescribed Fire Plans for individual projects.
- Makes entries into NFPORS database for prescribed fire and fuels treatment planning.
- Coordinates preparation and implementation of prescribed fire and fuels treatment projects.
- The NGPA Prescribed Fire Specialist will ensure that all park fire weather station equipment is operable and will perform required cyclic maintenance on the stations.

### ***Assistant Fire Management Officer (AFMO)/Training and Suppression:***



- Serves as Safety Officer for the Fire Management Program.
- Ensures all park fire weather equipment is operable and performs required cyclic maintenance on the stations.
- Coordinates annual firefighter refreshers.
- Develop, coordinate and conduct fire training as necessary to meet wildland fire needs of the park according to approved Fire Management Plan and local and national guidelines.
- Coordinates Fire Preparedness Reviews and site reviews.

**Fire Ecologist:**

- Analyze and interpret fire effects data and report findings to Park Superintendent and fire staff.
- Manage fire effects database (monitoring plot database, spatial data, photographic images).
- Assists with describing monitoring types and developing prescribed fire objectives.
- Coordinates fire-related research.
- Assists with writing various management plans and compliance documents; helps ensure ecological implications of fire are included in all park planning.

**Lead Fire Monitor:**

- Responsible for implementing the park's Fire Monitoring Plan and descriptions of monitoring types.
- Responsible for all standard (NPS *Fire Monitoring Handbook*, 2001) fire effects monitoring activities in the park; will coordinate with the Fire Program Coordinator and Fire Effects Liaison.

**Fire Program Assistant:**

- Provides technical and administrative support for the Area Fire Management Officer and all parks within the Northern Great Plains Area. Will assist with dispatching and mobilization activities.
- Collects and records daily fire weather observations and ensures they are entered into the Weather Information Management System (WIMS).
- Maintains records for all personnel involved in suppression and prescribed fire activities, detailing the individuals' qualifications and certifications for such activities.
- Updates all fire qualifications for entry into the DOI Shared Applications Computer System (SACS).

**PARK FIRE QUALIFICATIONS**

The park will target the following minimum number of qualified people for the identified fire management positions. Additional wildland qualifications will be developed from park staff as interest, training and physical fitness requirements allow. (see **Table 4 next page**)



**Table 4: TARGETED FIRE MANAGEMENT/INCIDENT MANAGEMENT POSITIONS**

Organizational Position	Number Targeted for Park	2003 Positions
Firefighter—Type II (FFT2)	20	35
Fire Effects Monitor (FEMO)	3	3/3T
Crew Boss (CRWB)	3	6/ 3T
Squad Boss (FFT1)	6	17/ 7 T
Engine Boss (ENGB)	6	8/ 4T
Ignition Specialist (RXI2)	3	5/3T
Burn Boss- Type II (RXB2)	2	1
Incident Commander-Type V (ICT5)	4	2/ 1T
Incident Commander-Type IV (ICT4)	6	9/ 1T
Incident Commander- Type III (ICT3)	0	2T
Tender Driver (WTOP)	3	4
Public Information Officer (IOF)	2	1/ 1T
Division Group Supervisor (DIVS)	0	1/ 1T
Helicopter Crew Member (HECM)	4	11/ 3T
Helicopter Manager (HEMG)	0	2T
Resource Advisor (RA)	4	0
Fire Use Manager (FUMA)	1	0
Radio Operator (RADO)	4	1
Personal Time Recorder (PTRC)	3	2/ 1T
Equipment Time Recorder (EQTR)	1	1/ 2T
Claims Recorder (CYMS)	1	1/ 1T
Base Camp Manager (BCMG)	1	2T
ATV Operator (ATVO)	10	18
Faller A (FALA)	5	10
Faller B (FALB)	0	10
EMT Basic (EMTB)	3	7
EMT Paramedic (EMTP)	0	1



Organizational Position	Number Targeted for Park	2003 Positions
Air Base Radio Operator (ABRO)	0	1
Security Type II (SEC2)	0	1
Security Type I (SEC1)	0	2
Engine Operator (ENOP)	0	1
Helispot Manager ( HESM)	0	2/1T
GIS Technician (GIST)	0	1
Display Processor (DPRO)	0	1
Field Observer (FOBS)	0	3
Firing Boss (FIRBS)	0	6
Equipment Manager (EQPM)	0	2
Ground Support Unit Leader (GSULT)	0	1T
Dozer Boss (DOZB)	0	2T
Strike Team Leader Engines (STEN)	0	2/ 3T
Strike Team Crew Leader (STRC)	0	2/2T
Task Force Leader (TFLD)	0	2/2T
Helicopter Call When Needed (HCWN)	0	1T
Helicopter Boss (HELB)	0	1T
Helicopter Manager (HETM)	0	1

The park has identified a need for personnel familiar with park-specific natural and cultural resource issues, as well as local terrain, land ownership, and access routes. These personnel would be used as Badlands National Park resource advisors and would advise cooperating agencies on park resource issues, serve as lookouts, advise on access routes, and serve as liaison with landowners. A minimum of three people should be qualified in this capacity.

All personnel, seasonal and permanent, involved in wildland fire suppression, prescribed burning, or fire monitoring will meet national standards as determined by the Interagency Wildland Fire Qualifications System. Park personnel assigned fire management responsibilities and tasks are to meet the minimum training and experience guidelines for the position held. All personnel involved in fire management operations will have their qualifications, training, and experience entered into the NPS Fire Qualifications System (SACS Database).



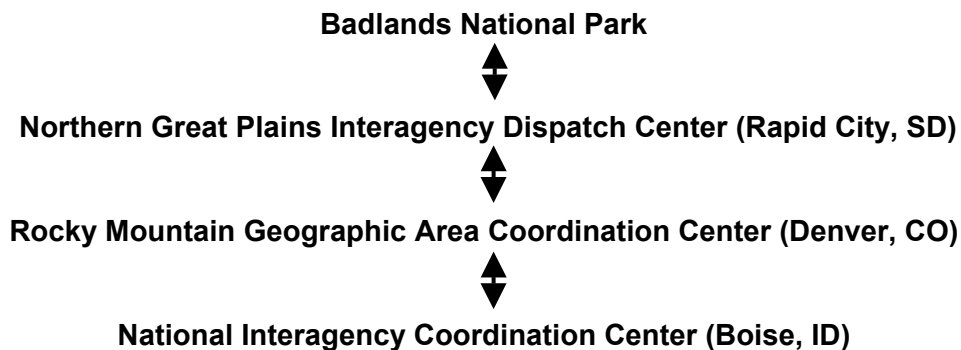
## INTERAGENCY COOPERATION AND COORDINATION

A statewide Interagency Cooperative Fire Management Agreement exists among the National Park Service, U.S. Forest Service, South Dakota State Division of Forestry, and 52 local fire departments (including Wall, Interior, and Rapid Valley). The SD Division of Forestry coordinates annual wildland firefighter certification and interagency mobilization of local fire departments. This agreement specifies reimbursement rates and procedures and is reviewed annually. See *Appendix E(3)* for a current listing of interagency agreements.

The National Agreement between the U.S. Departments of the Interior and Agriculture also serves as an umbrella agreement for interagency assistance. Closest forces for initial attack from the Bureau of Indian Affairs Pine Ridge Agency and the US Forest Service, Buffalo Gap National Grasslands, are currently utilized by informal agreement. Badlands National Park maintains close coordination with the Northern Great Plains Fire Management Office in Wind Cave National Park and the Area FMO at that office.

From an interagency standpoint, Badlands National Park is situated in the Rocky Mountain Geographic Area. Coordination for resource orders for in-park needs and out-of-park needs are served through the following logistical support sequence:

**Fig. 7: RESOURCE ORDER LOGISTICAL SUPPORT SEQUENCE**



The Northern Great Plains Interagency Dispatch Center, located at the Rapid City Airport (former terminal building) provides the primary wildland fire dispatching function for Badlands National Park. The Northern Great Plains Area Fire Management Office compiles weekly availability of Badlands National Park resources during fire season. This availability list is then provided to the Interagency Dispatch Center. Procedures for requesting assistance are found in the Rocky Mountain Interagency Mobilization Guide, published annually, and the Mobilization Guide for the Northern Great Plains Area.



## VII. MONITORING AND EVALUATION

FIREPRO funded long-term fire effects monitoring emphasizes vegetative responses to fire. Fire effects monitoring involves systematic collection and recording of fuels, topography, weather, air quality, and fire behavior data during wildland fire use and prescribed fires. Monitoring will follow the protocols outlined in the National Park Service *Fire Monitoring Handbook* (2001). This monitoring will be completed by the Northern Great Plains Area Fire Monitoring Team, duty stationed at Wind Cave National Park, with assistance provided by park Resource Management Specialist (Fire Effects Liaison) and park staff. Monitoring is essential to successful understanding of prescribed fires by evaluating the long-term achievement of the established, measurable resource management objectives described in the individual prescribed fire plan, and identifying any undesirable or unintended effects that may occur. Plots, photo points, and vegetation transects will be included as part of the monitoring program to document burn results and long-term vegetative response. Monitoring data will be archived and reviewed for future refinement of prescriptions and to determine program success.

The Badlands National Park Fire Monitoring Plan, included as *Appendix F* of this plan, details the fire effects monitoring program, including monitoring design, vegetative monitoring type, and data management protocols.

The park would like to institute an intensive ecological fire monitoring program that provides a more comprehensive analysis of the broad range of fire effects across various prairie community components, such as ground-nesting birds, lepidoptera, raptors, small mammals, rare plants, ungulates. However, funding for such comprehensive monitoring is non-existent. The NPS Northern Great Plains Inventory and Monitoring Program (NGP I&M), is part of a servicewide program, and is currently conducting baseline inventories of vascular plants, mammals, fish, herpetofauna, and birds for thirteen park units in the northern plains. The program will soon transition to targeted "vital sign" monitoring for key ecosystem indicators across the parks, and this monitoring will be integrated with the FIREPRO fire effects monitoring, leading to more ecologically-based, long-term monitoring. The Badlands Resource Management Program, the NGP I&M Program, and the NGPA Fire Program (with cooperators and contractors) will work to institute and conduct this monitoring.

Targeted short and long-term plant, animal, and paleontological resource monitoring, key to a particular Prescribed Fire Unit may be stated in the specific Prescribed Fire Plan for that unit. At a minimum, monitoring will comply with NPS monitoring protocol identified in the *Fire Monitoring Handbook* (2001). Data collected from short term monitoring will be attached to the fire report along with any narrative completed by the Fire Monitoring Team. It is the intent of the Badlands Resource Management Program to increase fire effects monitoring to include a wide variety of ecosystem indicators.



## VIII. FIRE RESEARCH

Fire research and long-term monitoring needs beyond the fire effects monitoring conducted by the NGPA Fire Monitors are addressed in the Resource Management Plan (1999), and will be more completely addressed when the plan is revised after *Director's Order #2.1: Resource Stewardship Planning* is approved. Additional work is needed to develop fire programs that better approximate natural fire results. Studies are needed to determine the effects of fire on various invasive non-native plant species. Some research has been done on the effects of burns at different times of the year, but further work is needed.

The Badlands National Park Resource Management Plan (1999) includes projects for fire research in the following areas: effects of fire on prairie dog colony size, fire effects on bighorn sheep range, historical fire frequency, effects of fire on exotic grass populations, impacts of fire on paleontological resources, effects of fire and fire seasonality on vegetation diversity and lepidoptera populations. These projects have been migrated to the PMIS project database.

In recent years the park has obtained FIREPRO research funding to study the effects of fire on fossils, and currently has a project under review by USGS Biological Resources Division to study fire impacts on the invasive non-native yellow sweetclover.

Park natural resource staff will continue to work in cooperation with the NGPA Fire Ecologist, research institutions, and other cooperators to develop, fund and conduct fire-related research projects.



## IX. SAFETY

### PUBLIC SAFETY

Because wildland fires are dynamic and can be hazardous, they must be given very high priority during certain critical conditions. Employees responsible for and involved in any wildland fire management activity must always consider the safety of human life above all other values. Assuring visitor safety takes priority over other activities at all times; being able to provide a consistent and accurate evaluation of fire behavior is the basis for plans, contacts, and briefings that ensure public and personnel safety. The following are Badlands National Park's public and employee safety considerations:

- There are limited opportunities to find safety zones for escaping from a fast moving wildland fire on the park trail and road system. Park visitors will likely not be able to recognize a safe area so emphasis will be to sweep potentially affected areas as quickly as possible.
- Certain areas will be closed to use when the risk to visitors is too high or there are not enough personnel to handle the situation any other way. The authority to close areas is cited in 36 CFR 1.5.
- Information concerning fire danger will be disseminated through entrance station and visitor center contacts, trailhead/bulletin board signing, and backcountry permit issuing.
- Any time human life may be endangered, all necessary means will be taken to warn or evacuate visitors and neighboring landowners and other users.
- Smoke on roadways may create a vehicle visibility hazard, from a fire burning nearby or at night under light wind conditions. It could also occur on roadways outside the park.

The Northern Great Plains Area Fire Management Office will inform the Fire Program Manager and the Superintendent of all potentially hazardous fires in the park. The Fire Program Manager and the Superintendent will then coordinate public and interagency notifications and implement suppression actions to mitigate the fire's impact within and outside the park. The extent of public notice will depend on the specific fire situation. The following actions should be considered:

- When fire affects travel along any roads in Badlands National Park, rangers will be dispatched to stop or control traffic. The State Patrol and Sheriffs office will be informed and assistance requested as needed.
- When evacuation of an area is recommended, the Superintendent and the Chief of Resource Protection will be informed immediately.
- When heavy smoke impacts the campgrounds or Cedar Pass Lodge, park personnel will be sent to inform people of the situation and assure them of the safety of remaining where they are. Notices will be posted in park campgrounds, prior to conducting prescribed fire projects and when wildland fire use incidents are in progress.
- When fire is projected to rapidly spread and threaten backcountry sites or trails where campers or hikers are known or strongly suspected to be, a park employee will be dispatched to the area by best possible means to notify visitors of the danger. Such individuals will be knowledgeable of fire behavior and fire safety principles to be able to





stay with visitors as long as needed to assist them to safety.

- As part of initial and continuing size-up, the incident commander will determine the proximity to the fire of any visitors or other land users, inform them of potential hazards, and aid in evacuation if needed. If life is threatened, and the parties do not cooperate, law enforcement assistance may be requested through dispatch.
- When needed, information on location, behavior, expected dangers, areas to avoid, and other precautions will be posted on park bulletin boards, at the entrance stations, local post offices, and businesses.
- When the risks from a wildland fire are high, precautionary signs will be posted on roads and trails leading into the fire area. Trails, campsites, and day use sites will be closed if deemed necessary by the NGPA FMO, and approved by the Superintendent. The Prescribed Fire Burn Boss will ensure that closure and/or informational signs on prescribed burns are properly posted.

An Incident Status Summary (ICS-209) for all fires burning over 24 hours will be provided to the park information officer. Information on the fire activity will be broadcast on the park radio as part of a morning report. The status summary will be distributed to all park divisions on a daily basis.

Smoke plume trajectories from large fires will be plotted using computer programs, weather information and onsite monitoring. Expected smoke impacts on off-park communities and roadways will be evaluated and information shared with the respective agencies. If needed, vehicular or air patrols will be used to monitor smoke plumes.

The Fire Information Officer will notify and make media releases to local TV and newspapers, and through electronic mail. If needed, a park information "hot line" will be installed, and the Fire Information Officer will update the message whenever new fire information is available. Additional notification will be made to cooperating agencies, as appropriate, about park fires through the Fire Information Officer.

## **FIREFIGHTER SAFETY**

Ensuring and maintaining firefighter safety is of the utmost importance and takes precedence over rapid suppression targets or goals. On all actions on wildland fires in Badlands National Park, the Fire Orders and the Watch Out Situations will be strictly adhered to. Failure to maintain communications and to obtain fire behavior predictions and weather forecasts constitute grounds for suppression forces to withdraw from firelines and re-establish tactics. It will be the responsibility of the Fire Safety Officer or the Park Safety Officer to ensure that all safety measures are implemented and anyone failing to adhere to fireline safety will be removed from the fire.

The Incident Commander or Prescribed Fire Burn Boss will ensure that:

- All firefighters will wear proper personal protective equipment.
- All firefighters will have completed basic wildland fire training S-130/190.
- Communications are possible with all people involved with the fire.
- Fire weather will be taken at minimum every hour during on going fires.
- All firefighters are certified (on their red cards) for the position they are performing.
- Any significant change in fire behavior or weather will be communicated immediately to everyone on the fireline.



## **X. PUBLIC INFORMATION AND EDUCATION**

Good public relations can engender public support and is prerequisite to a successful fire management program. Failure to provide good public information can be responsible for collapse of the program. On the prairie, fires can spread very quickly and visibly, necessitating that timely, accurate wildland fire information be provided to park visitors and adjacent land owners.

The Superintendent's Office will issue all press releases regarding fire danger levels, closures, special precautions, and prescribed fires to newspapers, radio and television stations, unless this task is specifically delegated to the Incident Commander or Incident Management Team. The Chief of Resource Education, or other designated staff member, when necessary, will function as Public Information Officer, and provide for effective communication between park personnel, the public, and the media. The fire management program will be incorporated into the park's overall interpretive program and explained when possible and appropriate. At higher staffing classes and/or during periods of high fire activity, a Public Information Officer may be ordered from outside the park.

Prior to prescribed fires, the Fire Program Coordinator will inform project personnel on details of the burn. Landowners or agencies located near the prescribed burn will be contacted and the Superintendent will initiate a press release. On the day of the burn, all staff should be notified as to the burn's location and any special safety warnings to pass on to visitors, i.e., caution to watch for smoke on the road, or advice not to hike in the area. Key visitor use or access sites where visitors could likely observe or approach the burn area should have temporary signs indicating a management fire is occurring. This provides for public safety and education, and decreases the likelihood that visitors will report or attempt to put out a wildland fire use or prescribed fire accomplishing resource objectives.

Post-season activities will include those tasks necessary to adequately assess how the local public and cooperators received the park's fire management efforts. This will be accomplished through coordination with neighbors, local groups, and the State Department of Air Quality. The bulk of this coordination will be performed by the NGPA Fire Management Office, though Badlands National Park staff will be involved, depending on interest and need. The purpose of this feedback is to revise plans, procedures, and educational efforts regarding overall fire management at Badlands National Park.

The Fire Program Manager will cooperate with the Chief of Resources Education on the following programs:

- Development of a brief interpretive handout which will discuss the basic objectives of using both Prescribed Fire and Wildland Fire Use.
- Develop an outline and materials for an evening program that contains a prevention message and describes the park's fire program.
- Maintaining a file of public comments received concerning prescribed burns, and using them to improve communication efforts targeted at increasing support for the fire management program.



## XI. PROTECTION OF SENSITIVE RESOURCES

The Fire Management Officer will work closely with the park's Chief of Resource Management and/or Chief of Resource Education to identify all historic, ethnographic, archeological, and paleontological resources; cultural landscapes; habitat for threatened, endangered, and other species of concern; and collections that need special attention to provide protection from fire. Badlands National Park archeological sites are described in the *Cultural Sites Inventory* book maintained in the office of the Chief of Resource Education at Cedar Pass. The Inventory and the Cultural Component of the Resource Management Plan will be consulted when planning prescribed burns, when considering fire use events, or during preparedness activities. Protective measures may be used around sensitive sites. All sensitive sites will be addressed in site specific Prescribed Fire Plans, or as required by the Cultural Resource Specialist.

When making decisions regarding management actions for wildland fire, incident commanders will consider potential impacts to resources including cultural resources prior to implementation. Cultural resource protection actions will be utilized when necessary and or safely possible. A variety of fire management techniques including black lining, foam and or water application, and mechanical fuel removal may be utilized to protect sensitive areas.

As a general rule, vehicle traffic is limited to established roads in the park and is strictly regulated in wilderness areas. Fire suppression and prescribed fire activities involve construction of black-line and scratch line, use of swatters, and direct attack with water, all primarily in fine fuels. Soil disturbance is not encouraged and will not likely occur under most fire management events. Consequently, cultural resources are not likely to be adversely affected. The order of attack, to minimize soil disturbance, is as follows:

- (1) Direct attack with water resources (engine use only from established roadways).
- (2) Use of swatters.
- (3) Burning-out to create a black-line.
- (4) Direct attack with water resources (off-road).
- (5) Construction of a scratch line.



## XII. FIRE CRITIQUES AND ANNUAL PLAN REVIEW

This Fire Management Plan will be reviewed and evaluated annually to determine if the resource objectives are current and being met, and to make necessary revisions. The Northern Great Plains Area Fire Management Office and Badlands Fire Management Team will conduct this evaluation. Any problems associated with the guidelines or standards set for fire management, cost effectiveness and suppression will be addressed through revision or addendum and made a part of this plan. The Superintendent will approve all revisions.

Fire reviews will be conducted in accordance with procedures found in *RM-18*. Each review will be documented and filed with the final fire documentation. The Fire Management Officer will retain a file copy.

The Badlands Fire Management Team and cooperators will critique all suppression actions on fires having extended attack and multi-period activities, if appropriate. If the need exists, the Regional Fire Management Officer can be included in such reviews and a national review by the National Fire Management Program Center can be requested.

All entrapment and fire shelter deployments will be reviewed in accordance with NWCG "Wildland Fire Entrapment/Fatality Initial Report and Entrapment Investigation Element Matrix" (*RM-18*, Chapter 13).



## XIII. CONSULTATION AND COORDINATION

Park staff, in cooperation with the Northern Great Plains Area Fire Management Office, carry out the fire management program with emphasis on human safety and prevention of damage to threatened and endangered species, natural resources, private and public buildings and facilities. Careful planning, good public information and a well-trained staff can provide for a safe and effective fire program.

The Northern Great Plains Area Fire Management Officer is responsible for coordination and consultation with cooperators regarding fire management activities. This includes involvement with the Midwest Regional Office; Rocky Mountain Coordinating Group; Northern Great Plains Interagency Dispatch Center; South Dakota Interagency Fire Council; U.S. Forest Service, Buffalo Gap National Grasslands; South Dakota State Forestry Department; Oglala Sioux Tribe; Bureau of Indian Affairs; and local cooperators.

The following staff participated in the planning and preparation of this fire management plan:

### **Badlands National Park**

- Bill Supernaugh, Superintendent
- Brian Kenner, Chief of Resource Management
- Scott Lopez, Chief of Resource Protection
- Bruce Bessken, former Chief of Resource Management
- Sandee Dingman, Resource Management Specialist
- Rachel Benton, Paleontologist
- Eddie Childers, Wildlife Biologist
- Doug Albertson, Wildlife Biologist
- Marianne Mills, Chief of Resource Education

### **Northern Great Plains Area Fire Management Office**

- Bill Gabbert, former FMO
- Mike Beasley, former AFMO/Prescribed Fire Specialist
- Dan Morford, AFMO
- Kara Paintner, former Fire Monitoring Team Leader
- Doug Alexander, FMO
- Cody Wienk, Fire Ecologist
- Andy Thorstensen, Fire Monitoring Team Leader

### **Others Assisting**

- Ed Delaney, former GIS Specialist, Wind Cave National Park
- Richard Bahr, former NPS Midwest Region Prescribed Fire Specialist
- Jim DeCoster, NPS Midwest Region Fire Ecologist



## XIV. APPENDICES

A. REFERENCES.....	A-1 to A-3
B. DEFINITIONS.....	B-1 to B-3
C. THREATENED AND ENDANGERED SPECIES LIST.....	C-1
D. ENVIRONMENTAL ASSESSMENT.....	D-1 to D-39
Public Notice (D-i – D-ii)	
Contents (D-iii)	
E. UNIT-SPECIFIC INFORMATION	
E(1) FIRE CALL-UP LIST.....	E(1)-1
E(2) PREPAREDNESS INVENTORY.....	E(2)1-E(2)-5
E(3) AGREEMENTS.....	E(3)-1
E(4) BADLANDS FIRE ECOLOGY.....	E(4)-1 to E(4)-15
Graph: 10 Hour Fuel Moisture by Month	
Graph: 100 Hour Fuel Moisture by Month	
Graph: Average Live Woody Fuel Moisture by Month	
Graph: Average Burning Index by Month	
Graph: Average Energy Release Component by Month	
E(5) BADLANDS FIRE HISTORY.....	E(5)-1 to E(5)-6
Table: Park Fires by Year	
Chart: Yearly Fire Occurrence by Cause	
Chart: Wildland Fire Ignitions by Month	
Chart: Monthly Fire Occurrence by Cause	
Chart: Wildland Fire Acreage by Year	
Chart: Wildland Fire Acreage by Month	
F. FIRE MONITORING PLAN.....	F-1 to F-57
Signature Page (F-i)	
Contents (F-ii – F-iii)	
G. PRE-ATTACK PLAN.....	(not complete as of 2004)
H. LONG-TERM PRESCRIBED FIRE SCHEDULE AND HAZARD REDUCTION PLAN	
H(1) TEN-YEAR PRESCRIBED FIRE SCHEDULE.....	H(1)-1 to H(1)-2
H(2) HAZARD FUEL REDUCTION AREAS & SCHEDULE .....	(none)
I. FIRE PREVENTION PLAN.....	I-1 to I-5
J. RENTAL EQUIPMENT AGREEMENTS.....	(none as of 2004)
K. CONTRACTS FOR SUPPRESSION AND PRESCRIBED FIRE	
RESOURCES.....	(none as of 2004)
L. BURNED AREA EMERGENCY STABILIZATION AND REHABILITATION	
PLAN.....	(none)

